THE IRON TRADE REVIEW

VOLUME XXX CLEVELAND, O. DECEMBER 16, 1897. CHICAGO, ILL. NUMBER 50

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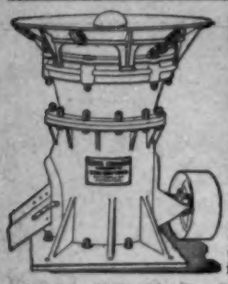

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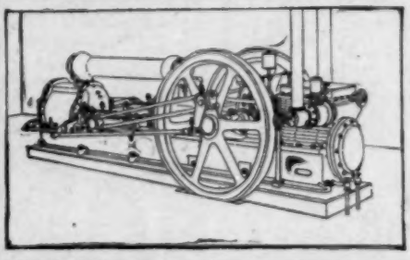

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. DECEMBER 16, 1897. CHICAGO, ILL. NUMBER 50

THE WEEK IN IRON CIRCLES.

The pool gossip of the week has been the chief feature, in the absence of any pronounced market developments. The wire consolidation scheme makes progress with every week, but the real test is yet to come, in the adjustments of appraisers' and owners' valuations and in the determination of the sort of equivalent the existing companies shall receive for their properties. It is conceded that the American Steel & Wire Co. must build wiser than any of its prototypes, in whatever department of industry, if it avoids the organic weakness of inflated capitalization. Whether it shall be as successful in discouraging additions to the country's producing capacity in rods, wire and wire nails, as some trusts have been in their particular lines, only time can determine. Report has been busy with attempts, more or less serious, to revive the rail and beam pools, in the past week. The Philadelphia meeting of representatives of several large steel companies might be judged, from the presence of the secretary of the old rail pool, to have some administrative relation to the old organization. At least nothing has been accomplished thus far in the direction of a new agreement. While it is being agitated, there is no present prospect of success. The destinies of one interest at least, would seem to follow lines away from, rather than toward, price agreements. Yet nothing is proposed, looking toward prices much above to-day's; rather a division of business and an aggressive export policy. Even this mild suggestion of the old pool is not hospitably received in some quarters. The proposition for a renewal of the beam agreement, with prices about $3 a ton higher than to-day's, is said to have originated in the East. There has been some conference, but Pittsburg structural mills are not urging the matter and its outcome is problematic. For indications as to the business of early 1898 the Pittsburg market has been most noteworthy the past week, while the East and the West have shown little life. In steel billets there have been heavy inquiries and some good-sized sales, with the present range of quotations $15 to $15.25, the latter on deliveries into February and March. Bessemer pig iron has been more active in the week and sales for deliveries in December, January and February are reported. Purchases for Shenango valley delivery in December and some attendant buying by middlemen gave a somewhat firmer market, at $9.35 to $9.45 for December and $9.50 to $9.75 for January and February, valley furnace. For 1898 delivery $9.75 is minimum with most furnaces. Some inquiry for foundry iron has come out, but it does not go to the buying point. For 1898 iron, $9.50 at valley furnace for No. 2 is the prevailing quotation. Leading Southern furnaces, under further reductions of stocks in November, are firm, and anticipate that the buying movement will start before production is likely to overtake and pass shipments.

THE CLEVELAND DISTRICT.

Iron ore shippers have begun footing figures on the largest volume of business ever done in the history of the Lake Superior iron ore trade. What has been lacking in market prices has been made up in some instances by enlarged tonnage; yet the season has given further proof of the drift of ore selling into fewer hands. Should the effort be renewed to include Mesabi mines in the Bessemer Ore Association, the new range, with its total of 4,280,000 tons will be in position to make a strong stand for percentage. Yet there is less to fear from over-production than in recent years. An enormous output will be called for by the market and the price will be such that only strong producers will be able to make money. The process of elimination will bear severely here and there, but it is not in the drift of things that the strong mojority should adopt a policy suggested by the necessities of the weaker few.

Pig Iron With the end of the year only a fortnight off some buyers of Bessemer pig iron have considered the time opportune to make purchases. Something like 40,000 tons has been taken in the past week, a good portion of it for December delivery to be piled by the buyer. Prices were from $9.30 to $9.45. For January and February some business has been done at $9.50 to $9.75, with the feeling firmer, among furnacemen. To-day it is doubtful if any considerable purchase for 1898 could be made below $9.75, valley. Sellers of foundry iron note considerable inquiry for 1898 shipment, Southern iron is being sought to a considerable aggregate. Business may be closed in the next two or three weeks, but the situation could easily turn either way—into a brisk buying movement, or into a prolonged wait. An Ohio pipe foundry will be in the market shortly. Little Southern forge is being sold, but mills are expected to take hold early in the year. Gray forge has been sold delivered at valley mill at $8.50. For next year $9.50 at furnace is the average quotation on No. 2 foundry. Sellers of Lake Superior charcoal have been rather more aggressive lately and some low prices have been made. We quote Cleveland delivery:

Bessemer	10 25	Valley Scotch No. 1	$10 75@11 00
No. 1 Strong Foundry	10 65@10 90	Valley Scotch No. 2	10 25@10 50
No. 2 Strong Foundry	10 15@10 40	Gray Forge	9 25@ 9 40
No. 3 Foundry	9 75	Lake Superior Charcoal	12 00

Finished Material. Negotiations for the revival of the beam pool are of interest locally. Should they succeed, the local structural mill would be again in position to take business, unless meantime the entire plant changed hands in the wire rod deal. There is only moderate inquiry in finished lines, with little or no change in prices. Bar iron is 95c, valley mill, with new business scarce, though increasing orders from car shops are expected in consequence of car-buying. Tank plates are 1c to 1.05c, Pittsburg; beams and channels, 1.10c, Pittsburg and steel bars, .95c. Sheets are fairly active at 2.05c, Cleveland for No. 27 and 2.10c to 2.15c for No. 28. Old material is very dull, particularly old iron rails and old steel rails. We quote $13 to $13.50 for the former and $9.50 for the latter; No. 1 wrought scrap, $10 to $10.50; mill scrap, $8.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, Dec. 15.

Not much business of any character is being transacted in this market at present, and it is not likely that the sales between now and the first of the year will be large. The demand is limited to small lots in nearly every case, and the outlook is that no large inquiries will be received this month. The quotations on nearly all classes of iron and steel are maintained quite firmly, and they are not expected to change immediately.

PIG IRON.—There has been a slight increase in the number of inquiries in the week, but nearly all are for small lots of iron, none in excess of 1,000 tons. It is quite likely that a good many of them will not develop into orders this year. One lot of iron was purchased in Indiana, and it is understood that this went at a considerable reduction from the current market quotations, but it was not sold by one of the larger furnaces. The Birmingham furnaces are all holding strictly to the quotations, and are not making any consessions to buyers. A good many buyers incline to the belief that prices will be lower within the next month, but the furnaces say that there is little chance of a reduction. The local furnaces and the larger Southern producers are well booked ahead, and are inclined to be very independent, but the smaller Southern interests are not supposed to be in such good condition, and if lower prices come it will be from this quarter.

Lake Sup. Charcoal	$12 50@13 00	South'n Coke No. 3	$10 35@10 60
Local Coke Fdy. No. 1	11 00@11 50	Southern No. 1 Soft	11 00@11 25
Local Coke Fdy. No. 2	10 50@11 00	Southern No. 2 Soft	10 60@10 85
Local Coke Fdy. No. 3	10 25@10 50	South'n Silveries	11 25@11 50
Local Scotch Fdy. No. 1	11 50@12 00	Jackson Co. Silveries	12 50@14 50
Local Scotch Fdy. No. 2	11 00@11 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 50@11 00	Alabama Car Wheel	16 00@17 00
South'n Coke No. 1	11 00@11 25	Malleable Bessemer	10 75@11 00
South'n Coke No. 2	10 60@10 85	Coke Bessemer	11 50@12 00

BARS.—The demand is not quite so large, and sales last week were slightly smaller than those of the week previous. The market is hardly so strong. Prices are made at 1.07½c to 1.15c for common iron, 1.15c to 1.20c for guaranteed, and 1.15c to 1.20c for soft steel bars from strictly billet stock.

CAR ORDERS.—Business in car material was not so heavy last week as in the week previous, but was still very fair. Several good orders were closed, and others are in abeyance. The railroads placed no large orders for cars last week, but several which have been hanging fire for some time past will undoubtedly be closed soon.

RAILS AND TRACK SUPPLIES.—Some business has been done, but most of it is in small lots and for immediate delivery. The roads are not as yet buying heavily for next year, but are expected to come into the market soon after the first of the year. Prices are as follows: Rails, $19 to $20.50, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts, with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.60c to 1.65c.

BILLETS AND RODS.—Some business has been done in this market by Eastern mills, but nearly all of it has been in small lots. Quotations are nominal at $17 for billets and $23.50 for rods.

STRUCTURAL MATERIAL.—Two drainage canal bridges, taking together about 4,000 tons of material, will be bid upon within the next week. No other large business has come up. General business in small lots has been light, and is not expected to improve immediately. Prices are as follows: Beams, 15-inch and under, 1.30c to 1.35c; 18, 20 and 24-inch, 1.40c to 1.45c; angles, 1.20c to 1.25c; plates, 1.15c to 1.20c; tees, 1.30c to 1.40c. Small lots from stock are quoted at one-quarter to one-half cent higher.

PLATES.—The demand is lighter, and will probably be small for the balance of the year. The local mills report small sales, and outside mills are not doing a very heavy business. Nearly all orders being placed call for small lots. Quotations are made as follows: Tank steel, 1.15c to 1.20c; flange steel, 1.25c to 1.35c; firebox steel, 1.85c to 5c.

SHEETS.—There has been a fairly good demand for both black and galvanized sheets, but sales last week were not quite so large as those of the week previous. Quotations are made at 2.20c to 2.25c for No. 27 black and 80 and 5 to 80 and ½ per cent discount for galvanized.

MERCHANT STEEL.—Business continues to be very fair, although it does not include any very large orders. Prices follow: Open-hearth spring, tire and machinery steel, 1.65c to 1.75c; smooth finished machinery steel, 1.60c to 1.65c; smooth finished tire, 1.45c to 1.50c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—Orders have been light, and the demand shows no signs of becoming larger at present. Dealers are not looking for much improvement before January,. Dealers' selling prices are as follows:

Old iron rails, gross	$12 00@$12 50	Axles, net	$14 00@$14 25
Old steel rails, long, gr.	10 50@ 11 00	Cast borings, net	4 00@ 4 25
Old steel rails, short	9 00@ 9 25	Wrought turnings, net	5 50@ 6 00
Old wheels, gross	10 50@ 11 25	Axle turnings, net	7 25@ 7 50
Railroad forge, net	11 75@ 12 00	Mixed steel, gross	7 00
Dealer's forge, net	9 00@ 9 50	Stove plates, net	6 00@ 6 25
No. 1 mill, net	8 00@ 8 50	Heavy melting steel, gr.	8 00@ 8 25
Heavy cast, net	7 75@ 8 25	Old iron splice b., net	13 25@ 13 75
Malleable cast, net	9 00@ 9 25		

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Dec. 15.

The week has developed active business for next year. Billets have sold heavily and also Bessemer pig, the latter for deliveries running to February. Both are quoted higher. An effort is being made to revive the beam pool and it may succeed. Beams accordingly are firm and, like all finished material, find a heavy inquiry for next year, though immediate-delivery business is slack. The rail basis for 1896 is accepted for the time being as $18, Pittsburg, and the local mill will begin the year with a good tonnage.

PIG IRON.—There has been a much stronger market for Bessemer in the last few days, with no apparent cause other than the heavy buying of steel. A Shenango valley interest is credited with buying upwards of 30,000 tons of December iron which it is intended to pile. There have been other sales of smaller size on which prices are variously reported from $9.35 to $9.50, for prompt delivery and $9.50 to $9.75 for deliveries into two months of next year. Beyond this it is still impossible to buy at to-day's quotation. There are several inquiries for gray forge, owing doubtless to still weaker prices. One for 5,000 tons is current, and a $9 quotation, Pittsburg, did not take the business. Sales are reported at $9 and subsequently $9.15 was done. A sale of No. 2 foundry iron at $10.50 is reported in the face of quotations made at lower figures. Quotations follow:

Bessemer, valley Dec-Feb	$ 9.50	to	9.75
Bessemer delivered Pittsburg District	10.00	to	10.25
No. 1 Foundry	10.75	to	10.90
No. 2 Foundry	10.25	to	10.40
No. 3 Foundry			10.00
Gray Forge			9.10

BILLETS.—The cheap steel offered in the Wheeling district last week was sold without pressure and these sales have been followed by heavy buying for the first three months of next year. Tonnage estimates of business closed range about 50,000 tons and much more is known to be pending in inquiries. Some buying by middle men is included in the sales reported but consumers have also been buying. Billets are firmer and $15 is accepted as minimum. On future deliveries $15.25 has been done.

SHEET BARS,—Sheet bars have also been active and a considerable tonnage has been closed at from $17 to $17.25. Inquiry is heavy but there is not much eagerness to sell beyond January.

RODS.—The movement toward a wire combination is causing an active market for rods and buyers are much more numerous than selling mills. Prices have advanced and are firm at $23 and $23.25.

SHEETS.—The bulk of sheet inquiries remain uncovered. A more decided stand has been taken by mills making light gauges, in their refusal to sell ahead and the outlook for next year is regarded as more hopeful than a week ago. Mails from the Eastern territory shows an eagerness to buy not apparent a week ago. Present wants are light and No. 28 is selling for December shipment at 2.05c.

STRUCTURAL MATERIAL.—An incident of the conference of steel interests in the East last week was an attempt to revive the beam pool and there are indications that such a movement may go through in the next few days. It is urged by the Eastern interests and Pittsburg mills do not appear to be over-enthusiastic. Little buying has resulted from the rumors, but the inquiry for all structural shapes is very heavy for next year. Structural work in New York aggregating many thousand tons will be let during this week. Beams, 15 inches

and smaller, are firm at 1.10c; 18 to 24 inches, 1.20c; universal plates, 1.05c; tees, 1.10c; zees, 1.10c; angles, 1.10c.

SPELTER.—The market for spelter is quieter and prices are holding at $3.75 and $3.85.

PIPES AND TUBES.—Relief for the weak market for merchant pipe is not expected until inventories are taken and jobbers being the new year. Prices for the present are still weaker and are virtually where they were last summer. This, however, is only true of merchant pipe. Oil country trade is very active and the unprecedented demand for boiler tubes continues. We repeat the agreed discounts, omitting the 5 to 10 per cent extra discount now prevailing on merchant pipe: Butt weld black, 72 per cent off; lap weld black, 78 per cent off; butt weld galvanized, 67 per cent off; lap weld galvanized, 70 per cent off. The second discount is 10 per cent on car load lots. Discounts on merchant boiler tubes are as follows: 2¼-inch and smaller, 72½ per cent off; 2½-inch and larger, 75 per cent. off.

RAILS AND TRACK MATERIAL.—From present indications $18, Pittsburg, will be the basis for rails in the early part of 1898. Edgar Thomson starts the year comfortably filled and there is no apparent reason now for a clash over prices Sales in the last 10 days have been steady and $18, Pittsburg, is quoted. On track material we quote: Iron track bolts, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c; splice bars, 1.10c to 1.15c; links and pins, 1.15c to 1.20c.

BARS.—In steel bars inquiry is heavy but altogether for next year. There is little to tempt low prices, but 95c has been done on sales during the week. Iron is not much of a factor in current business and common is quoted at 90c to 95c, valley, and 1c to 1.10c, Pittsburg. All-muck branded bars are quoted from 1.25c to 1.35c.

IRON AND STEEL SKELP.—Skelp is quoted as follows: Grooved steel skelp, 95c to 97½c; sheared steel skelp, 1.02½c to 1.05c; grooved iron skelp, 1.10c to 1.12½c; sheared iron skelp, 1.17½c to 1.20c.

OLD MATERIAL.—An indifferent offer of $10 was made for steel rails by a heavy buyer during the week and more was refused. Compulsory sales only are occurring and in these for small lots of wrought scrap $10.50 has been paid, for cast scrap, $9.50 and for old iron rails, $13.25 to $13.75. The approach of inventories is believed to be preventing any activity.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. During the past week a number of large buyers have sent out inquiries for round lots of iron, and a few sales of notable size have been reported, but the buyers claim to have secured concessions from the regular asking price. A prominent Western rolling mill would not buy because of present price of finished material it could not afford to pay the ruling figures on Southern gray forge iron. It is now a period when the market will be tested. A considerable division of opinion exists as to whether the next three or four weeks are to be marked by the "usual holiday dullness," or whether we are to have some life in them. There is certainly a better inquiry just now. It is mainly for small quantities for more or less prompt shipment and there is more buying of the retail kind too than there has been. Traveling men report that they find the concerns that they visit busy and as a rule cheerful. There is a general agreement in looking for a smart buying movement before long. The question is, when will it begin and if it is postponed for 60 days, say, can present prices be maintained until then? The Southern iron masters are confident that they are in a position to maintain prices, as they are still being pressed for shipments. Stocks in Alabama last month materially decreased and thus far in December the ratio of decrease shown in November has been maintained. If consumption keeps up at the present rate, it seems inevitable that prices will be firmly maintained, if not advanced. Considerable interest now centers in the railroad situation. New car contracts are frequently reported, and there is a disposition on the part of the roads to put themselves into better shape to handle traffic. The decision of the Inter-State Commerce Commission, granting extra time for putting safety appliances on the freight cars, has removed the dread of further complications in movement of freight. Lake Superior charcoal has been sold at lower figures than were ever before known. There is an evident disposition on the part of the furnaces to move their product, and the buyer has almost made his own price. We quote for cash f. o. b. Cincinnati: Southern coke, No. 1 foundry, $10; No. 2, $9.75; No. 3, $9.45; gray forge, $9.25; mottled, $9; No. 1 soft, $10; No. 2, $9.75; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Tennessee charcoal, No. 1, $12.50 to $13; Jackson Co. silvery, No. 1, $12.50 to $13; Standard Georgia car wheel, $14.25 to $15.

Buffalo. The market is showing the usual holiday inaction. A small run of business is in progress and some consideration is being given to requirements for the early part of 1898, but as a rule there is not much offering in the way of fresh business. A noticeable feature is the absence of requests to hold off deliveries, which at this season of the year are usually numerous but at present exceedingly rare. This is thought to indicate a more general employment than customary of the consuming shops. We do not observe pressure to sell from any direction. Quotations given below are on the cash basis, f. o. b. cars Buffalo: No. 1 strong foundry coke iron, $11.25; No. 2, $10.75; Ohio strong softener, No. 1, $11.75; No. 2, $11.25; Jackson Co. silvery, No. 1, $14; Southern soft, No. 1, $11.75; No. 2, $11.35.

THE TIN PLATE MARKET.

There is comparatively little to say on the market this week, because even the concessions made by sellers within the past month have created little, if any, interest among the larger buyers. The trade has been confined mostly to retail transactions and sellers are becoming quite restless under the continued dull business. There is no quotable change in prices, but it is entirely probable that a firmer feeling will develop as soon as any buying begins. Indications are that some contracts for spring and summer deliveries may be made within the next two or three weeks. We quote, as follows, f. o. b. Pittsburg, or Indiana districts:

CHARCOAL TINS.

	IC	IX
Lisvane Grade,	$3.45	$4.20
Calland Grade,	3.65	4.35

COKE TINS.

IC, 108 lb.	Basis weight,	$2.95
100 lb.	" "	2.85
95 lb.	" "	2.80
90 lb.	" "	2.75
85 lb.	" "	2.70
80 lb.	" "	2.65

TERNE PLATES.

IC, 216 lb., 20 x 28		$5.95
200 lb.	"	5.65

The Inland Iron and Forge Co.

The organization of the Inland Iron & Forge Co., of Chicago, recently incorporated with $225,000 capital stock to take over the plant and business of the East Chicago (Ind.) Iron & Steel Co., has been completed. The officers elected are the following: President, P. D. Block, treasurer of the Inland Steel Co., Chicago Heights, Ill.; vice-president, S. J. Llewellyn, formerly with the Illinois Steel Co.; secretary and treasurer, G. H. Jones, vice-president of the Inland Steel Co.; general manager, L. E. Block, of Dreifus, Block & Co., Pittsburg. The board of directors consists of the above and Frank Wells, J. H. Porter, E. Colbert, and J. W. Thomas, of Chicago, and Joseph Block, of Cincinnati. The product of the company will be bar iron and steel, and iron and steel car axles. The capacity of the plant is estimated to be about 4,000 tons a month of all products. The plant will at once be put in shape to operate, and it is expected to be ready to start shortly after the first of the year. The new company is well equipped to do business, as all its officers are actively engaged in the iron trade at present, and are widely and favorably known.

A SALEM, O., dispatch says that W. D. McKeefrey, superintendent of the Grafton furnaces, received a serious knife wound, at the hands of an intoxicated employe, whom Mr. McKeefrey found fighting with another workman and ordered from the premises.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

PUBLISHED EVERY THURSDAY BY

THE IRON TRADE REVIEW CO.,

CLEVELAND, OHIO.

CLEVELAND, 27 VINCENT STREET:

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CHICAGO:
1142 MONADNOCK BLOCK.
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PITTSBURG:
807 TRADESMEN'S BUILDING.
JAMES R. MILLS, JR., Manager.

Subscription (strictly in advance), $3 per annum. Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW, through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

DECEMBER 16, 1897.

In practical value to the foundryman, the paper of Dr. Wuest before the fall meeting of the German Foundrymen's Association, the translation of which has appeared in three consecutive issues of *The Iron Trade Review*, ranks among the first of recent contributions to foundry literature. The table given in our last issue, for which, together with the translation of the entire paper, our readers are indebted to the painstaking of Dr. Richard Moldenke, contains the key to problems that are continually arising in the making of mixtures. Jobbing founders in particular will find Dr. Wuest's deductions as to the values of pig irons and their scrap-carrying capacities, and as to the proper relation between the thickness of a casting and its silicon contents, of much value as an index to the lines upon which more exact and more detailed work in physical and chemical determinations shall proceed. A close approach to a formula is given in the second table of the paper, in which Dr. Wuest concludes, from the analyses of 120 castings, representing a wide range of work, that castings of a thickness below 2-5 inch require 2.5 to 2.8 silicon; those from 2-5 to 4-5 inch thick, a silicon percentage from 2.1 to 2.3; those from 9-10 inch to 1 1-5 inch thick, a silicon percentage from 1.9 to 2.1; those from 1 1-5 to 1 3-5 inch thick, 1.7 to 1.9 per cent silicon, and those above 1 3-5 inch thick, a silicon percentage of 1.5 to 1.7. An added conclusion from Dr. Wuest's experiments is that with green sand molds the silicon contents should lean toward the upper limit, while with dry sand or loam the lower limit is to be taken.

A four-page supplement to the Dec. 10 issue of the *Bulletin* of the American Iron and Steel Association gives an admirable presentation of the armor plate question. Tracing the history of legislation on the subject from the making of the first contract with the Bethlehem Iron Co., on June 1, 1887, for 6,700 tons of armor, the article goes step by step over the developments of the past 10 years —how Carnegie, Phipps & Co., Ltd., were induced in 1890 to erect a plant after having refused to enter the business, believing it to be unprofitable; how the contracts of 1893 were let, and how the price was reduced $59 a ton on the contracts for 1896, which were for 5,600 tons, making a total of 24,800 tons to both companies, up to the present time. The inquiry into the cost of armor plate is reviewed and the report of Secretary Herbert is analyzed, to show how faulty have been the estimates of the cost of building and maintaining plants. The contract taken to furnish plate to the Russian Government, of which so much has been made, is detailed, and we give elsewhere the portion of the article on this phase of the subject. A careful reading of Mr. Swank's review, which is not an argument nor a plea, but a plain, straight forward statement, suggests that there has been much injustice and much jumping at conclusions in the popular presentations of the question, and that the sober, second thought will not find the enormous profits that some legislators have seen in this business. The armor plate commission, it may be said, has found good reasons why Government manufacture would not be profitable and its report may be taken as the quietus of the project for Government ownership.

The rounding up of another year's business on the Great Lakes emphasizes afresh the importance of these great highways as factors in American industrial development. From and into Lake Superior alone more than 18,000,000 short tons of freight has moved in the past season. And much of this business has been carried at a rate of less than one-half mill per ton mile. It is not going beyond obvious deductions from the figures relating to this enormous traffic to say that the deep water guaranteed by the improvements of the past five years has been a large factor in so reducing the cost of American steel that it has found entrance to foreign ports under the very shadow of great plants whose position had been regarded impregnable. And among those who have studied most closely the development of lake traffic it is agreed that only the beginning has been seen of the contributions of lake commerce to the conquests of American industry on foreign shores.

Personal.

Harry W. Frost, who has been secretary and Western business representative of the *Railway Age* for the past five years, has resigned that position to become general sales agent of the Monarch Brake Beam Co., of Detroit, Mich. Mr. Frost's wide acquaintance in railway circles, and his unusual business ability will make him a valuable acquisition to the Monarch Company.

S. J. Llewellyn, who has just taken the position of vice-president of the Inland Iron & Forge Co., of Chicago, has been engaged in the iron trade for a number of years. He has been connected with the Illinois Steel Co. since its formation, as assistant manager of the Milwaukee works, and later in charge of the sales department of the same works, and previous to the organization of the Illinois Steel Co., was with the North Chicago Rolling Mill Co., for a long time. Mr. Llewellyn is looked upon as one of the best posted men in the bar iron and steel business, and his connection with the new company will prove valuable to it.

P. M. Boyd, secretary of the Johnson Co., Lorain, O., has

gone to England and will be absent several months.

Geo. H. Fisher, formerly manager of the Eagle Iron & Steel Co., Ironton, O., has become manager of the Olive Foundry & Machine Works at that place.

John Smith, Sr., superintendent at the Ohio Steel Co.'s plant, Youngstown, O., has resigned to accept a similar position with the Colorado Fuel & Iron Co., at Pueblo, Col.

THE WIRE AMALGAMATION.

The plans of those who are promoting the merging of the wire rod, wire and wire nail plants of the country in a single organization to be known as the American Steel & Wire Co., are becoming known in greater detail as the circle of concerns negotiated with grows wider. A meeting of the representatives of the larger companies was held in New York, Dec. 9 and 10 and further arrangement of preliminaries was effected. There is no trouble about getting the smaller concerns; as might be expected, they are most anxious for the success of the project. No difficulties have been encountered thus far, moreover, in securing assurances of financial backing; but rather in getting one or two larger interests to give options on their plants. The company represented by large plants in Massachusetts and Illinois has been indifferent. The consolidation offers it little guaranty of larger returns, and hence the figure it would consider, to give up its identity, would be a high one. It was represented at New York and is now understood to be willing to sell.

The larger plants, which have been optioned first, are those of the Washburn & Moen Mfg. Co., Worcester, Mass,. and Waukegan, Ill.; Cleveland Rolling Mill Co., HP Nail Co., and American Wire Co., Cleveland; Consolidated Steel & Wire Co., Chicago with plants at Beaver Falls, Rankin and Allentown, Pa., and Cleveland; New Castle Wire Nail Co., New Castle, Pa.; Oliver & Snyder Steel Co., Oliver Wire Co. and Pittsburg Wire Co., Pittsburg; American Wire Nail Co., Anderson, Ind.; Jno. A. Roebling's Sons Co., Trenton, N. J. Of additional Western plants considered are the I. L. Elwood Mfg. Co., DeKalb, Ill., and Dillon-Griswold Wire Co., Sterling, Ill. No portion of the Illinois Steel Co.'s plant is to be taken over, according to present plans, but all the rods turned out by the company would be purchased, and undoubtedly the large tonnage of billets that has gone from the Illinois Steel Co. to the Waukegan plant would continue. In the case of the Oliver & Snyder Steel Co. and the Cleveland Rolling Mill Co., it is understood that the purchase of the entire plants, including steel works and blast furnaces, is contemplated. The Cleveland Rolling Mill Co. has three furnaces and the Pittsburg company has the Edith, while Rosena at New Castle, is under lease. The Oliver ore interest, which is one-sixth of the Carnegie-Oliver mines, would mean an annual product of 450,000 tons probably, while the Jackson mine of the Cleveland Rolling Mill Co. produces something less than 100,000 tons a year. The valuation of the Cleveland Rolling Mill Co.'s properties would be several millions.

The work of the appraisers—Julian Kennedy, of Pittsbug; S. T. Wellman, Cleveland, and Robert Forsyth, Chicago—is now under way. An auditing committee, representing some of the English capital which is said to be enlisted in the enterprise, will go over the books of the various concerns.

The capacity of the plants which it is expected eventually to include in the new company, is about 50,000 tons a week of rods, wire, and wire nails. No such product has ever been made, of course—probably less than half of 2,500,000 tons has been produced in the year of largest output. It will be seen, therefore, that even with the export trade extended in the way that is expected, under the consolidation regime, a good many plants must be shut down, while others will be run for a maximum output. The American Wire Co.'s plant, Cleveland, is named as one that would probably be closed.

The difficulties that attend the work now in progress can be readily appreciated. To make appraisals is one thing, to make them liberal enough to suit those immediately concerned is another. Yet those who are closest in touch with the work are most confident that the deal will be consummated. The skepticism is largely on the outside. To provide for all the officials who must be taken care of in the new organization will be a chief source of trouble. These and other questions usually considered matters of final detail, may prove more difficult than the preliminaries.

The name of Geo. T. Oliver, of Pittsburg, has been most prominently mentioned, in connection with the presidency of the $50,000,000 combine. John W. Gates has been from the beginning an active promoter, but it is stated on what seems excellent authority, that Mr. Gates's present relation to the Illinois Steel Co. will continue. It does not appear that J. H. Parks, the manager of the wire nail pool of 1895-'96, has any prominence in the present movement, probably for the sufficient reason that the new company has no desire to inherit any of the reputation that attached to that profitable but unpopular organization. From all that can be gathered, it is the intention to keep prices on a modest level. The favor of the outside world will be won by such a policy and another very important end served—the discouragement of the competition of new and thoroughly modern plants which it is now freely predicted the combination would encounter at no distant day.

RUSSIAN CONTRACTS FOR AMERICAN ARMOR.

Reeference has been made at different times to a contract for armor made by the Bethlehem Iron Co. with the Russian government at a low price, and use has been made of this contract as a reason why the United States should insist on a similar low price. Such argument does not consider all the facts in the case. This contract with the Russian government, on which both the American companies presented bids, was desired by them to demonstrate to European governments their ability to produce armor plate of the very highest standard, and in order that American armor plate manufacturers might be placed on the admiralty lists of Europe. The only method by which such listing could be made was simply to enter the European market and take a contract irrespective of cost. Up to that time no inquiries had come from abroad for tenders of armor. The impression had been spread throughout Europe by the foreign manufacturers of armor plate that nobody but themselves knew how to make armor plate; that Americans especially had not learned how to make it. Scarcely anybody in the marine departments of any of the European governments had any respect for American armor plate or American ships armored with such plate; consequently the new American navy was not considered very seriously. The attempt on the part of American manufacturers to enter the foreign markets was held by foreign makers to be the height of presumption, and, in order to completely kill such competition, they reduced in this case the price of their armor to a very low figure.

The Bethlehem Iron Co., having no work from its own Government, and determined to prove its ability to make armor plate of the best quality, decided to secure the Russian contract at any price, and, after fierce bidding, it was awarded to the company at the unprofitable price of $249 per ton. It should be remembered that this low price was not the result of fair business competition but of a jealous contest based on European resentment of what was considered an intrusion of a foreign competitor into European territory.

There has been much misunderstanding in regard to the character of the armor plate furnished under this contract. The total number of tons embraced therein was 1,561; of this amount only 556 tons were nickel-steel hard-faced or Harveyized armor, similar to that required by the United States Government. The remainder was homogeneous nickel-steel oil-tempered armor, and hence less resistance and less expensive to manufacture than the Harveyized armor.

After the Harveyized plates were delivered, and had successfully passed the rigid inspection and severe ballistic tests to which they were subjected, it became apparent that they were not only as good as, but substantially better than, any made in Europe. These tests were watched with keen interest by representatives of foreign governments, and their preconceived ideas as to the quality of American armor suffered a severe shock. They certainly suggested to them also possibilities in the new American navy.

The Russian government, satisfied as to the superiority of American armor, subsequently contracted with the Bethlehem Iron Co., for 1,150 tons of their hard-faced or Harveyized armor plate at a price of $520 per ton, and with the Carnegie Steel Co., for 1,000 tons of the same quality at a price of $530 per ton.—[Bulletin of the American Iron and Steel Association.

THE BRAEBURN STEEL CO.'S PLANT.

Less than eight months ago the Braeburn Steel Co. was incorporated under the laws of Pennsylvania and plans for a crucible and open-hearth steel plant were drawn. *The Iron Trade Review* has noted from time to time the various steps in the erection and equipment of the plant and is now enabled to go somewhat more fully into details, with the aid of an interior and an exterior view of the plant.

The moving spirit in the new company, Mr. Wm. Metcalf, is known as Past President of the American Society of Civil Engineers, as well as through his connection with various Pittsburg steel interests, notably the Crescent Steel Works. Associated with him as directors are Mr. Charles Metcalf and Mr. Philip B. Hasbrouck and as secretary and treasurer, Mr. R. P. Kelly. Braeburn is on the Allegheny Valley Railway, 23 miles from Pittsburg, within the limit that secures it all the advantages in freight schedules afforded Pittsburg shippers. Its location on the Allegheny River will afford additional advantages when the projected improvements on that river are completed by the Government.

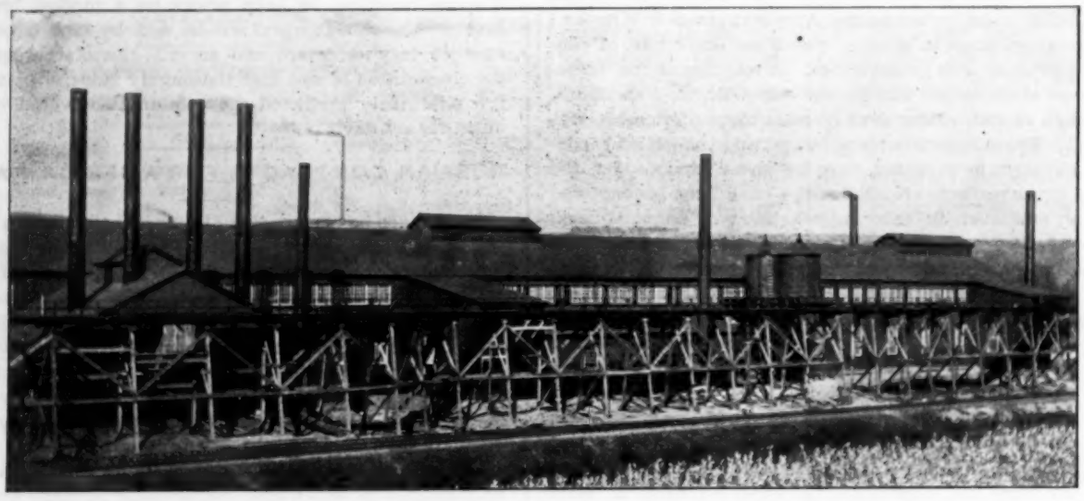


FIG. 1.—BRAEBURN STEEL WORKS. MAIN BUILDING, SHOWING COAL TRESTLE FOR DELIVERING COAL FROM MINES.

The property of the Braeburn Steel Co, includes 16 acres lying between the railroad and the river. Adjacent lands are well suited to become the site of a town, and the latter has already begun to take shape.

The exterior view of the plant given herewith includes only a part of the main building which is a steel structure 725 feet long with 53 feet span. The building is a model of convenience, well lighted and ventilated, and was built by the Shiffler Bridge Co., of Pittsburg. The same view also shows the trestle by which coal is brought from the company's mines, 800 feet south of the A. V. R. R., and delivered through chutes to the boilers and gas producers. The interior view was taken when equipment was in progress, the stands for the 10-inch mill being shown in their incomplete state.

The arrangement of the plant is such that the progression from raw to finished material is as near continuous as possible and without any rehandling whatever. A switch from the Allegheny Valley Railway delivers raw materials at one end of the building where are the various stock-houses. Running to these warerooms is also a 2-ft. gauge railroad which carries material to all parts of the plant. Materials are conveyed on it by means of a Jeffrey electric trolley locomotive and flat steel cars of a special design.

Within the building are first a crucible melting furnace and a 5-ton basic open-hearth furnace. Next comes the ingot room where ingots are inspected and stored. In succession follow the 14-inch and 10-inch bar mills. In each case the train of rolls extends across the building. The roll trains were built by the Frank-Kneeland Machine Co., of Pittsburg. The rolls are driven by Wm. Tod & Co. engines located in lean-tos opposite the bar mills. Beyond the bar mills comes the forging department, in which at present are three hammers of 3 tons, 1,500 lbs., and 500 lbs. capacity, respectively, built by Bement, Miles & Co., of Philadelphia. A forging press is to be added later, and beyond this in the extreme end of the building is the annealing department.

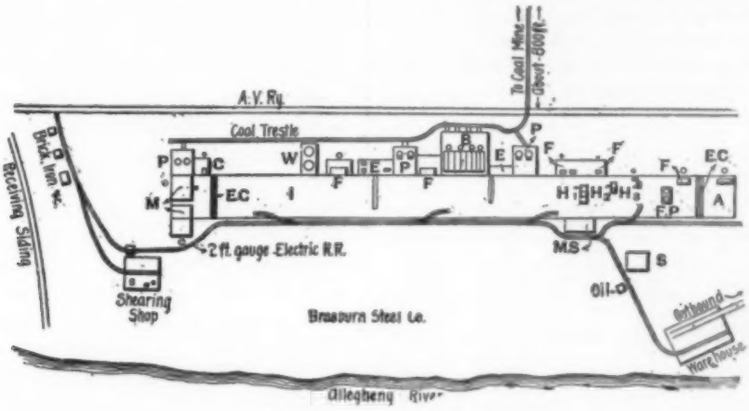
FIG. 2.—BRAEBURN STEEL WORKS. INTERIOR VIEW.

The furnaces are of the Siemens regenerative type, and are located so that material can be delivered and withdrawn by the overhead cranes. It is intended to have no directly fired

coal furnaces, but at present natural gas is used in the smaller furnaces. Four Smythe gas producers are provided.

The system of transportation afforded by the 2-ft. gauge railroad is a feature of the plant. The tracks reach all parts of the works and extend also to the warehouse for finished material which is located some distance from the main building. In addition to removing finished material, the electric line is invaluable in carrying material from department to department. The handling of unfinished product is also facilitated by the system of overhead cranes which run the entire length of the building. They were built by the Shaw Electric Crane Co., Muskegon, Mich., and are of 10-ton and 5-ton capacity, respectively. They were furnished by the Manning, Maxwell & Moore agency, in Pittsburg. Card generators were supplied by the Card Electric Co., of Mansfield, O. There are four batteries of boilers used which were installed by R. Munroe & Son, of Pittsburg

The charges for the furnaces are brought from the shearing shop on iron cars, pushed into the main building, picked up by the electric crane and delivered on the furnace platforms. Either of the cranes can take ingots from the ingot inspecting and storing room and deliver them to any of the furnaces in a few moments. All of the furnaces, gas producers, boilers, and mill engines are under lean-to sheds on the side next to the Allegheny Valley Railway. The furnaces are so placed



14-in. Bar Mill. 10-in. Bar Mill.

M—Melting Furnaces.
P—Gas Producers.
C—Crucible Shed.
I—Ingot Floor.
W—Water Tanks.
F—Heating Furnaces.
B—Boilers.
H1—3-ton Hammer.
H2—1,500 lb. "
H3— 500 lb. "
F P—Forging Press.
A—Annealing Dept.
Main Building, 725 ft. long; 50 ft. clear span.
E C—Electric Cranes.
E—Engines.
M S—Machine Shop.

BRAEBURN STEEL WORKS.

that ingots can be delivered directly to the furnace doors, and heavy ingots can be put into and drawn from the furnaces by the electric cranes.

A plan view of the plant is given herewith, for which we are indebted to the *Railroad Gazette*.

Nothing has been spared in getting the best equipment and all possible reductions in cost of production have been attempted without endangering the highest standard of material. The new company will make high grade tool and open-hearth steel, bars and forgings of various sorts. The main offices are at Braeburn.

THE A. & P. Roberts Co., of Philadelphia (Pencoyd Iron Works), has received word that its bid for the bridge over the River Yssel, near Westervoort, Netherlands, to be built for the Government of Holland., has been rejected, and that the next highest bidder, a Dutch firm, has been awarded the contract. The bid submitted by the Pencoyd Iron Works was $474,000, the lowest offer, while that of the successful firm was $478,000.

THE American Pig Iron Storage Warrant Co.'s yards contained 257,100 tons of pig iron Dec. 10, 8,400 tons having been put in yard and 3,400 tons withdrawn in the preceding 10 days.

SHIPMENTS of 5,000 tons of pig iron were made on Dec. 13, by the Tennessee Coal, Iron & Railroad Co., and the Sloss Iron & Steel Co., to Kobe and Yokohama, Japan.

12,215,645 TONS OF ORE.

RECORD-BREAKING SHIPMENTS IN 1897.

The season which closed on Sunday night, Dec. 12, when the last cargo of ore left the Escanaba docks has established a new record for Lake Superior iron mines. Almost 2,000,000 tons more were shipped by water than in 1895, when the unprecedented record of 10,233,910 tons was made by the ore docks of Lake Superior and Lake Michigan. This year's total has gone quite beyond expectations; and yet when it is considered that present consumption of Lake Superior ores is at a yearly rate closely approximating 14,000,000 tons, it can be appreciated that 1897 has only made a record that in the order of things is quite certain to be broken in 1898. The amount of old-range Bessemer ore shipped this year is somewhat below the full 5,000,000 tons allotted by the pool, but it is only less because a few of the smaller mines did not operate at all. Such mines as were operated sent down their full quota, and some of them readily could have sold more. The Mesabi range, with an output of 4,280,873 tons, has increased by 50 per cent on its record of 2,882,079 tons in 1896, and has furnished 35 per cent of the total. The Duluth & Iron Range Road, which was outdone by the Duluth, Mesabi & Northern, in tonnage last year—the totals being respectively 1,813,992 and 1,988,932 tons—has made a great record for 1897, a total of 2,651,465 tons against 2,376,064 tons by its rival. As is well known, the range of prices has been low for all ores. At $2.65 for Norrie, Fayal, the Mesabi ore most closely corresponding to it, has sold at $2.10, making a deferential of 55 cents. Non-Bessemer Mesabi ores have sold below $2. Non-Bessemers of the Negaunee group, for which $2.75 was asked early in 1896, and $2.35 to $2.40 in the middle of last year, brought $2.15 to $2.20 the past season. Both for iron mining and vessel companies the season has been one of low prices and small returns. The deep water available this year is all that has saved the season from being generally disastrous to marine interests.

LAKE ERIE RECEIPTS, 10,120,908 GROSS TONS.

Though most shippers were well through in early November, extraordinary efforts were made by others to get down the largest possible tonnage, and thus the latest closing record is reported from nearly every upper lake port. The last boat from Escanaba in 1895 left on Dec. 7; in 1896 on Dec. 5; this year on Dec. 12. The figures below give an exact statement of receipts at Lake Erie ports, publication being withheld a week longer than usual so as to make the record complete. As in other years, the statement of ore on dock given in the second table is the amount shown by statements of Dec. 1. The aggregates are as follows, the receipts, it will be seen, exceeding those of the greatest preceding year, by more than 2,000,000 tons:

Receipts at Lake Erie ports, season of 1897.....10,120,906 tons.
On dock at Lake Erie ports, Dec. 1, 1897..... 5,923,755 tons.

The figures printed by *The Iron Trade Review* in May, 1897, showed ore on Lake Erie docks amounting to 3,256,497 tons. Adding the receipts of the season and subtracting the amount on dock Dec. 1, 1897, shows that the shipments to furnaces since May 1, (including ore taken directly into furnace yards at Cleveland, Buffalo and Tonawanda), was 7,453,648 tons, against 5,021,146 tons in the same period in 1896 and 6,339,496 tons in 1895. The table below gives receipts at Lake Erie ports in 1897 and the preceding five years:

IRON ORE RECEIPTS AT LAKE ERIE PORTS, GROSS TONS.

Ports.	1897.	1896.	1895.	1894.	1893.	1892.
Toledo	416,438	301,794	260,730	158,384	145,515	139,987
Sandusky	79,792	58,667	12,361	23,043	4,464	49,736
Huron	198 211	226,515	146,442	172,775	137,700	65,000
Lorain	355,188	191,445	214,219	150,424	165,667	190,400
Cleveland	2,456,704	2,313,170	2,312,370	1,624,573	1,260,716	1,950,224
Fairport	1,008,340	941,446	914,617	976,222	792,517	866,611
Ashtabula	3,001,914	2,272,822	2,474,791	1,987,722	1,845,738	2,555,416
Conneaut	495,327	327,623	244,967	237,905	203,207	1,130
Erie	1,311,526	847,849	811,989	624 438	469,299	645,230
Buffalo* ..... Tonawanda	797,446	545,101	719,742	395,339	308,238	197,000
Total	10,120,906	8,026,432	8,112,228	6,350,825	5,333,061	6,660,734

*Buffalo alone in 1892.

A noteworthy gain was made by Ashtabula, putting it far in the lead, after surrendering that position to Cleveland for 1896. Erie, also, shows a heavy increase; Conneaut, Toledo and Buffalo make good gains. The table below gives the amount of ore on dock at the various ports, Dec. 1:

IRON ORE ON LAKE ERIE DOCKS, DEC. 1, GROSS TONS.

Ports.	1897.	1896.	1895.	1894.	1893.	1892.
Toledo	194,644	151,959	113,132	96,157	92,911	71,409
Sandusky	84,786	59,491	34,375	77,004	78,439	87,500
Huron	230,029	200,075	101,000	147,632	89,000	45,000
Lorain	317,509	231,288	224,264	223,732	201,632	147,600
Cleveland	1,478,355	1,419,311	1,209,792	1,441,785	1,163,930	1,347,992
Fairport	825,312	773,905	605,470	660,980	578,033	610,609
Ashtabula	1,835,694	1,441,666	1,301,302	1,439,119	1,296,431	1,312,658
Conneaut	360,895	275,800	292,460	199,365	91,337	
Erie	484,871	355,222	335,718	454,233	359,827	401,683
Buffalo	111,660	82,267	207,199	94,239	119,170	125,000
Total	5,923,755	4,954,984	4,415,712	4,834,247	4,070,710	4,149,451

While 2,000,000 tons more came to Lake Erie ports in 1897 than in 1896, the stocks on dock this year are only about 1,000,000 tons more than on Dec. 1, 1896. But for the lack of cars, that was so great a cause of friction in the operations of the past year, the proportion of direct ore would have been still greater.

SHIPMENTS FROM UPPER-LAKE PORTS.

The table below shows the amount of ore shipped this year from each of the upper-lake ports named. Positions have changed somewhat. Last year's order is just reversed for the first three ports, and it is now Two Harbors, Duluth, and Escanaba, the last named having been in the lead for many years, with the exception of 1894, when it was second. For comparison, the figures for five preceding years are given:

LAKE SHIPMENTS OF IRON ORE, GROSS TONS.

	1897.	1896.	1895.	1894.	1893.	1892.
Escanaba	2,302,121	2,321,931	2,860,172	1,644,776	2,048,.81	4,010,085
Marquette	1,945,519	1,564 813	1,079,485	1,424,850	1,086,934	1,026,338
Ashland	2,067,637	1,566 236	2,350,210	1,738,590	1,1 7,5.0	2,223,684
Two Harbors	2,651,465	1,813,992	2 118,156	1,373,253	903,329	1,164,076
Gladstone	311,014	220,887	109,211	79,208	203,585	115,886
Superior	531,825	167,245	117,884		80,273	4,245
Duluth	2,376,064	1,988,932	1,598,783	1,369,252	440,592	
Total by lake	12 215,645	9,644,036	10,233,910	7,629,829	5,880,918	5 880,918
Total rail		290,792	195.127	118,394	178,037	178.037
Total shipm'ts		9,934,828	10,429,037	7,748,223	6,058,955	9,074,243

The Two Harbors total includes 12,265 tons put into vessels which will remain at the head of the lakes through the winter. Taking the amount received at Lake Erie ports from the total as above, 12,215,645 tons, gives the total shipments to South Chicago and Bay View and to the few charcoal furnaces that receive ore by water. The total of all ore that did not go to Lake Erie is thus 2,094,739 gross tons. All-rail shipments will bring the year's total from all ranges close to 12,500,000 tons.

OUTPUTS OF CERTAIN RANGES AND MINES.

The 1897 output of the various mines and ranges in the Lake Superior region will not be known with exactness until after Jan. 1, when the all-rail shipments for the calendar year can be added to the movement by water. As there is probably no all-rail ore from Mesabi and Vermilion mines, the figures for those ranges are substantially in their final shape. Of Mesabi properties the outputs for 1897 are as follows, the Hull, Rust and Burt of the Lake Superior group being put down as one, and the Mesabi mountain and Lone Jack going together under Oliver:

	Tons.		Tons.
Mountain Iron	765,000	Oliver	609,612
Fayal	642,939	Mahoning	519,892
Biwabik	427,466	Genoa	309,514
Lake Superior group	259,910	Auburn	175,263
Adam	175,800	Sparta	66,722
Norman	101,070	Ohio	47,309
Commodore	60,797	Cincinnati	32,720
Roberts	18,614	Hale	13,728
Cloques	12,215	Penobscot	11,933
Franklin	30,169	Total Mesabi	4,280,873

The four mines on the Vermilion range and some of the leading properties on other old ranges made shipments in 1897 approximately as follows:

	Tons.		Tons.
Minnesota	592,196	Tilden	300,000
Chandler	438,336	Chapin	556,825
Pioneer	207,103	Montreal	190,000
Zenith	40,817	Aurora	165,000
Norrie	800 000	Newport	150,000
Lake Angeline	485,000	Ashland	105,000
Lake Superior	375,000	Queen	212 000
Cleveland Cliffs	720,000	Penn Iron Mining Co.	237,900
Republic	125,000		

The following statement of water shipments by ranges is interesting. The Marquette range sent 554,818 tons by way of Escanaba; the Gogebic range, 136,927 tons, and the Menominee range 1,610,376 tons:

	Gross tons.
Marquette Range	2,540,575
Menominee "	1,911,152
Gogebic "	2,204,564
Vermilion "	1,278,481
Mesabi "	4.280,873
Total water shipments	12,215,645

Lake Superior Iron Mines.

The Pioneer mine, at Ely, Minn., which made an output of 207,000 tons the past year, has closed down, and 250 men are idle. This action, it is said, is the result of the contention between the fee-owners and the lessees, in connection with the effort of the Carnegie-Oliver interests to lease the property. The short term remaining on the lease, nine years, makes it impossible for the lessees to sub-let, and the fee-owners have asked a large bonus for extending the term of the lease now. The fee-owners will get about $70,000 on the ore mined the past year, but the minimum royalty amounts to but $10,000. If the mine is not operated neither side will make money, and the expectation is that some agreement may be reached at length.

John Fulton, mining engineer, of Johnstown, Pa., has been on the Mesabi range the past two weeks looking up properties that have not yet been taken up for active working. His visit was in the interest of a well-known steel company.

Dublin Contracts for the Riter-Conley Co.

Thos. B. Riter, of the Riter-Conley Co., of Pittsburg, who arrived home from Europe last week brought the contracts taken by him in Ireland, from the Dublin United Tramway. The work includes two draught stacks which will be 200 feet in height and ten feet in diameter in the clear. The plates used will be 3/8, 5-16, and 1/4-inch. The anchorage consists of eight anchor bolts, each two inches in diameter with screw ends 2½ inches in diameter. The bolts are 12 feet long and are imbedded in masonry. Other work contracted for is an engine house, 179 feet long; a boiler house, 76x131, carrying a floor load of 400 lbs. per square inch, a coal storage house, 27x72. The boiler room will be equipped with suspended hoppers or coal bins made of 3/8-inch plates, and water and dust tight, which are made by the Riter-Conley Co.

It is believed at Washington that some arrangement will yet be made with the Bethlehem and Carnagie companies for armor for the three battleships now under construction.

SCRAP-CARRYING AND PIG IRON VALUES.—III. *

(CONCLUDED.)

The proper proportion of silicon required in the mixture can be readily determined by calculation. First we must know the silicon of the pig iron. Let us say this is 3.5 per cent. Now comes some heavy scrap which may happen to be available, and with a normal fracture and a thickness of 1¼ inch, can be classed as 1.7 per cent silicon, which is not allowing too much. The question we are asked to solve is to produce castings of, say, ½-inch thickness, requiring, therefore, 2.3 per cent. silicon.

TABLE III.

55 lbs. pig iron containing 3.7% si=	1.93	lbs. si.
45 lbs. scrap iron containing 1.7% si=	0.76	"
100 lbs. of mixture contain	2.69	lbs. si.

Of these 2.69 lbs. silicon contained in the mixture about 15 per cent burns out in remelting in the cupola. The finished casting, therefore, has a silicon content of 2.29 per cent. By using this method of mixing irons no serious difficulties are encountered, as for instance in the case in No. 97 in Table I, where a casting ¼-inch thick has only 1.7 per cent silicon, while another from the same foundry (No. 99), 2-inch to 2.8-inch thick runs 2.7 per cent or just 1 per cent more silicon. In using this method of adjusting the silicon to the thickness of the castings, mistakes due to the lack of a sufficient amount will rarely occur, while on the other hand the presence of an excess of this valuable constituent, is also avoided. Scrap iron will be found to run fairly uniform in composition when compared with its thickness, so that with a known composition of the pig iron, the production of good castings in the cupola is fairly certain, and the percentage of loss is reduced.

However, in order to make up the mixture in this rational manner, it is absolutely necessary to know the composition of the pig iron. We must leave the old fashioned, unreliable way and adopt chemical analysis in its place. Besides the knowledge of the silicon contents, which is, of course, essential, we must also be certain of the upper and lower manganese limits. I would say 1.3 to 0.7 per cent. The manganese contents of a foundry iron would then move between these limits and thus assure us that we do not get too much of it in the castings, and therefore not enough to harden the castings, yet a sufficient quantity to protect the silicon while remelting.

We must next know the phosphorus of the pig iron, for the higher this is, the poorer the castings. I have atttempted to collect the data necessary for the proper valuation of a pig iron, and desire you to look at Table IV. We take 2.5 per cent silicon as the base, and for every 1-10 per cent above or below this a differential of 12½ cents is allowed. The base price of a pig iron below .1 per cent phosphorus is $15.36 per ton; for 0.3 to 0.8 per cent P., it is $14.88; for 0.8 to 1.3 per cent P., $14.16; and for 1.3 to 1.8 per cent P., it is $13.44. These prices, corresponding to the present market value of pig iron (Sept., 1897), are taken as base prices, and can go up or down with the rise and fall of the market.

TABLE IV.

Silicon.	Under 1% P.	0.3—0.8% P.	0.8—1.3% P.	1.3 to 1.8% P.
2.0	$ 14.76	$ 14.20	$ 13.56	$ 12.84
2.1	14.88	14.40	13.68	12.96
2.2	15.00	14.52	13.80	13.08
2.3	15.12	14.64	13.92	13.20
2.4	15.24	14.76	14.04	13.32
2.5	15.36	14.88	14.16	13.44
2.6	15.48	15.00	14.28	13.56
2.7	15.60	15.12	14.40	13.68
2.8	15.72	15.24	14.52	13.80
2.9	15.84	15.36	14.64	13.92
3.0	15.96	15.48	14.76	14.04
3.5	16.56	16.08	15.36	14.64

In order to test this method of valuing pig iron, to see if it corresponds to actual conditions met with in foundries, I will calculate a few mixtures based upon the above figures. Let us take the above mentioned example. A 3.5 per cent silicon iron with .1 per cent phosphorus costs $16.56. Scrap costs $12.48. The total cost of the mixture (to give castings of 2.3 per cent Si.), is as follows:

55 lbs. pig iron, with	1.93 lbs. silicon, costing		$0.414
45 lbs. scrap, "	0.76 " "		0.255
100 lbs. mixture, with	2.69 lbs. silicon, costing		$0.669
15% burned away, —	0.40		
Casting contains	2.29 lbs. silicon, or about 2.3% si.		

Now if we take a pig iron with 2.8 per cent silicon instead of the rich 3.5 per cent Si. iron used above, the cost of the iron, according to Table IV., would be $15.72 per ton. To obtain the same mixture the following proportions must be used:

90 lbs. pig iron containing	2.52 lbs. si., costing		$0.643
10 lbs. scrap, "	0.17 " "		0.057
100 lbs. mixture, containing	2.69 lbs. si., costing		$0.700
Loss in remelting, 15%, —	0.40		
Casting contains	2.29 lbs. si., or about 2.3% si.		

From this we see that in order to produce thin castings running 2.3 per cent in silicon, the comparatively more expensive high silicon pig (3.5 per cent) gives a cheaper mixture than the lower priced 2.8 per cent Si. pig iron. The solution of pig iron as based upon its silicon contents, is therefore, quite important, and the above examples are very close to practical conditions.

A further example may be cited: Required a casting to contain 1.6 per cent Si., that is to say, one of a rather heavy section. Let us assume that we have on hand scrap running 1.7 per cent in silicon. We also wish to use a pig iron with 2.9 per cent Si., and between 0.3 and 0.8 phosphorus. The scrap costs us $12.48 a ton, and the pig iron $13.36. The following conditions obtain in this case:

18 lbs. pig iron, with	0.52 lbs. si., costing		$0.126
82 lbs. scrap, "	1.39 " "		0.475
100 lbs. mixture, with	1.91 lbs. si., costing		0.601
Loss, 15%, —	0.28		
Casting contains	1.63 lbs. si., or about 1.6% si.		

For purpose of comparison let us take a pig iron with the same phosphorus but only 2.2 per cent Si., costing $14.52 a ton. We then have the following:

40 lbs. pig iron containing	0.88 lbs. si., costing		$0.264
60 lbs. scrap, "	1.02 " "		.0.341
100 lbs. mixture, containing	1.90 lbs. si., costing		$0.605
Loss, 15%, —	0.28		
Casting contains	1.62 lbs. si , or about 1.6% si.		

We see again that the high silicon pig made the cheaper mixture, with the same silicon contents in the resulting casting.

The appreciation of a pig iron with a rising silicon content is therefore perfectly justified, and these examples are only what is met with in daily practice. By purchasing pig iron based upon its silicon contents the German blast furnaceman has some thing to gain also. In the year 1896 Germany imported 300,000 tons of English foundry pig iron. This enormous amount of foundry material which comes from England by way of the Rhine and the Elbe into the interior of Germany, competes heavily with our home product. This could easily be obviated, and it should be one of the first duties of the newly formed pig iron pool to take up this matter and force the English iron out of the German market. Sales memoranda based upon the silicon contents of the iron would be a mighty lever for this purpose, for the preference which English pig iron enjoys on the part of German foundrymen, does not come from its inherent good qualities, but from the fact that it is very uniform, and that the habit of raking up old recipes calling for English or Scotch brands is still resorted to in producing special castings. The pig iron comes to Germany by way of the harbors of Rotterdam, Ruhrort, etc., and here the iron is reloaded and thus well mixed, the identity of the various heats being completely merged into each other. This is not the case with German pig irons, the blast furnaces shipping direct, and naturally differences occur in the various shipments due to the process itself of making iron. If such differences were brought to the attention of the foundry engineer promptly, so that he could regulate his mixtures accordingly, it would per contra help to crowd out the English iron

Again the high silicon iron requires more fuel than the production of low silicon material; consequently blast furnace men would be paid according to their product, and not as at present, when the difference in price between a No. 1 and a No. 3 is $1.68, while the silicon contents of both are often identical. It is surprising to find people yet who will pay

*Translated from Dr. Wuest's paper before the German Foundrymen's Association, by Dr. Richard Moldenke.

such prices for the nice large crystals shown up by a coarse grained fracture.

When a No. 1 iron is to be bought, it should be only taken from hematite stock, which is just as high in price as the regular brands of No. 1 foundry irons. Hematite irons run lower in phosphorus and can carry considerable cheap Luxemburg irons, making as cheap mixtures as the regular No. 1 foundry irons with Luxemburg irons, which, however, would give trouble on account of an excess of phosphorus.

Iron or Steel for Boilers?

G. M. McCauley, manager of the Central Iron Works, Harrisburg, Pa., makes this contribution in the last issue of the *Boiler-Maker*, to an inquiry that has perennial interest in to users of plates, sheets and tubes:

"The question of the relative merits of iron, as compared with steel, for certain kinds of structural work and for use in boilers, etc., is one which comes up very frequently for discussion. The question is so often asked, and there is such an increased demand for iron for certain kinds of work, that it will be of interest to buyers to know that the best charcoal fire-box and flange iron can still be obtained from manufacturers who have recognized that it cannot be dispensed with, although it is true that manufacturers of boiler plates have largely abandoned the making of charcoal iron.

"We think that regardless of the matter of cost of material boiler-users all agree that the old-fashioned hammered charcoal iron, flange and fire-box quality, is superior to steel in many respects for use in boilers. With the advanced knowledge of the art of making steel, and the uniformity of quality which has been attained, there is no question but better steel plates are being made for boiler work than in the earlier stages of steel-making. There are, however, conditions where iron is a much more suitable material for the purpose than steel. There are chemical as well as physical conditions which can only be met by a superior grade of iron, and hence the large demand for charcoal-iron tubes and plates.

"Experience proves that steel tubes and plates corrode quicker than iron, and that steel plates and boilers show more rapid corrosion and less resistance to the effect of contraction and expansion in heating and cooling, hence the life of steel is shorter than iron. Iron boilers which have been in use in the plant with which the writer is connected for over twenty years are practically as good as new, while experience with steel boilers has been nothing like satisfactory. This same result is shown with steel stacks, where a few years' service will corrode and destroy the steel, while good tank-iron endures for a long period of time. It is demonstrated beyond a question that for many purposes in construction work, such as brewery tanks, water tanks, water pipe, gas and oil pipe, iron shows greater life, and many users, having tried steel, have abandoned it and returned to the use of iron. Old-fashioned charcoal iron, while scarce and of very high price, has a long and satisfactory record, and it nevertheless becomes economical to use it in many cases. The cost of material is a small matter compared with the other costs that go to make up a completed boiler. It takes just as much labor and just as many rivets to build a steel boiler as an iron boiler, the difference simply being in the pound price of material. The trade wants whichever one will last the longest. If steel can show as good a record as iron, then steel should be used, because it is cheaper."

EDWIN G. NOURSE, assistant engineer in charge of construction of the new Crescent bridge by the Davenport & Rock Island Bridge & Terminal Co., at Rock Island, Ill., was instantly killed by a falling derrick Dec. 8. Mr. Nourse was one of the best known and most successful scientific engineers in the West. He gained particular distinction through his achievement in designing the railroad terminal tracks entering the World's Fair grounds in Chicago. For many years he was chief engineer of the Chicago & Evanston Railroad, and was indentified with the engineer departments of the Milwaukee, Northwestern and Santa Fe systems. He was also prominently identified with the building of the bridge across the Mississippi at Minneapolis. He was born in Moline, and was 49 years of age,

PUBLICATIONS RECEIVED.

The Sargent Co., Chicago, has sent out its monthly calendar for December. This issue is a single sheet, as were the previous ones, on heavy cardboard, and contains, reduced, all the illustrations of the company's calendars for the previous months of the year. One-half of the 12 pictures making up the design are devoted to the company's railway department, and show brake shoes and railroad steel castings. The other six pictures show general machinery castings, each of which was the most notable casting made by the company in the month for which the calendar was issued.

The Moore Mfg. Co., formerly of Milwaukee, which for the past two months has had a Cleveland residence, occupying a portion of the HP Nail Co.'s plant, has issued a new catalogue. In connection with its chain hoist, which has been illustrated in these columns, the company is manufacturing a line of trolleys, and is now making direct differential pulley blocks of the Weston pattern. Various types of trolley are built—a geared yoke trolley, with four wheels, steel roller bushed, for I beam track; plain yoke trolleys, plain plate trolleys and combined screw hoist and geared trolley. The catalogue also gives views and details of the steel door hanger and rail for which there has been a large demand.

A specimen of artistic trade literature is put out by the Frank-Kneeland Machine Co., of Pittsburg, illustrating very fully the capabilities of their plant in the manufacture of chilled rolls, heavy mill and other machinery. The illustrations include roll turning lathes, lever shears, vertical shears and punches, shears for billet and tin plate mills, roll trains, housings, structural and bar mills, etc. The plant is a very complete one and its facilities are of modern types.

"Operation of Electric Mining Plants" is the title of an interesting publication by the General Electric Co. It describes and illustrates some typical installations of electric plants in running, with detailed statistics of cost of electric haulage, including original outlay for locomotives, wiring, etc. The costs of operation are presented in letters from mining companies using electric equipment. In each case the approximate saving over mule haulage is shown. In the Lake Superior region the example taken is the Cleveland-Cliffs Iron Co.'s installation at Ishpeming, the figures for which were printed in our issue of Aug. 27, 1896, in connection with the proceedings of the Lake Superior Mining Institute.

"The Elementary Principles of Machine Design," by J. G. A. Meyer, author of "Modern Locomotive Construction," is a pamphlet of 92 pages published as No. 1 of the Industrial Library. Among other contents are a discussion of proportions of connecting rods, piston rods and pistons for steam engines, with instructions for setting a plain slide valve and eccentric. Suggestions are also given for making all necessary calculations and working drawings. The Industrial Publication Co., New York, is the publisher. The price is 25 cents.

The World's Consumption of Iron.

Dr. Rentzsch has prepared for the German Iron and Steel Society the following table of the production and consumption of pig iron in 1896 per head of population in various countries. The figures are for pounds:

	Production.	Consumption
Great Britain	485	255
Belgium	316	174
United States	267	260
Germany	267	200
France	133	122
Austria-Hungary	53	64
Russia	24	41

This country is shown as the largest consumer per head (and of course absolutely; as it has a larger population than an other country except Russia); but it is very closely followed by Great Britain, which consumes this raw material very largely in manufactured goods exported. Belgium and Germany are the only other large exporters of iron manufactures.

THE Monongahela Tin Plate Co., Pittsburg will increase its plant of 9 mills to a 14-mill plant, and has given the word to the Robinson-Rea Mfg. Co. The hot mill department will be remodeled and the cold rolling department will be enlarged by the addition of new mills. The tandem system will be used.

METHOD OF HANDLING BLAST FURNACE STOCK.

The era of big blast furnace outputs has brought many improvements in provisions for rapidly collecting and distributing materials. The big stock grounds at Sparrow's Point, and at Duquesne, and their extensive equipment for handling ore, fuel and flux, are examples in point. A recent addition to the products of invention in this direction is an apparatus designed by Max M. Suppes, of Lorain, O., for collecting the stock in a blast furnace yard in an efficient and economical way, and rapidly conveying it to the foot of a hoist leading to the furnace top. Mr. Suppes' plans, which are indicated in the illustrations, provide for the arrangement of the stock-yards as well as for the construction of the bins and a carrier that weighs the stock as it is collected.

The large number of ingredients of a furnace charge, as is well known, makes expensive the usual practice of conveying each component in a separate barrow to a pair of fixed scales and then carrying each barrow to the top of the furnace to dump it. The collection and weighing of the material require the services of a large number of hands. The system devised and patented by Mr. Suppes involves a stock-carrier having a vessel supported by a weighing mechanism. This receptacle will contain a large part or the whole of a charge, as desired, and the arrangement of bins and tracks is such as to reduce to a minimum the labor required and the distance traversed. Fig. 1 is a side elevation, for the most part in section, of the stock-bins, stock carrier and a car into which the contents of the carrier are discharged for transfer to the top of the furnace. Fig. 2 is a front elevation of the stock-carrier and shows also portions of the stock-bins and tracks. The bins 1, 1, receive the stock from cars standing on the tracks 2, 2, which are on the ground level, but which may be elevated where conditions make underground bins undesirable. Concrete or similar material forms the foundations 3 of the bin, and 4, 4 are vertical metal beams, and 5, 5, I beams supporting the track structures. Each bin has a number of discharge-chutes 6, 6, so that if stock cannot be obtained from one, owing to scaffolding, the operator passes to the next. A door 8 closes the mouth of each discharge-chute.

The chutes all extend into the continuous pit between the rails of the track 10, in which an electrically propelled car 11 runs, carrying the bucket 12. The bucket is suspended by the frame work 13 which carries a knife-edge 16, on the car platform. The lever 15 is connected to the scale-beams 17, 17. The car is moved from bin to bin by motors controlled by the rheostats 19, 19. The operator's seat is at 29. In filling the bucket the foot-lever 20 is pressed, raising the door 8 by means of the chain 21. When the scale beam indicates to the operator that he has taken the requisite weight of the particular kind of stock in his bin he releases the foot-lever and passes to a bin containing some other kind of stock.

When the desired charge has been secured the car is moved opposite the skip-pit 22, where the skip is ready to receive the contents of several buckets and carry them to the furnace top. When the lever 24 is thrown, chains raise the trip arms, 26. The weight of the stock against the door 27 opens it and the weight 28 assists in keeping it open until the bucket is emptied, when the door closes automatically; while the throwing back of the lever 24 allows the trip-arm to fall into its normal position. In details of construction, the apparatus may be varied from what is outlined above—for example, the bucket may be secured above the car instead of below—but broadly the invention covers the combination of stationary bins, the stock-carrier movable along an adjoining track, and the carrier's weighing mechanism supporting a receptacle passing in its travels beneath chutes.

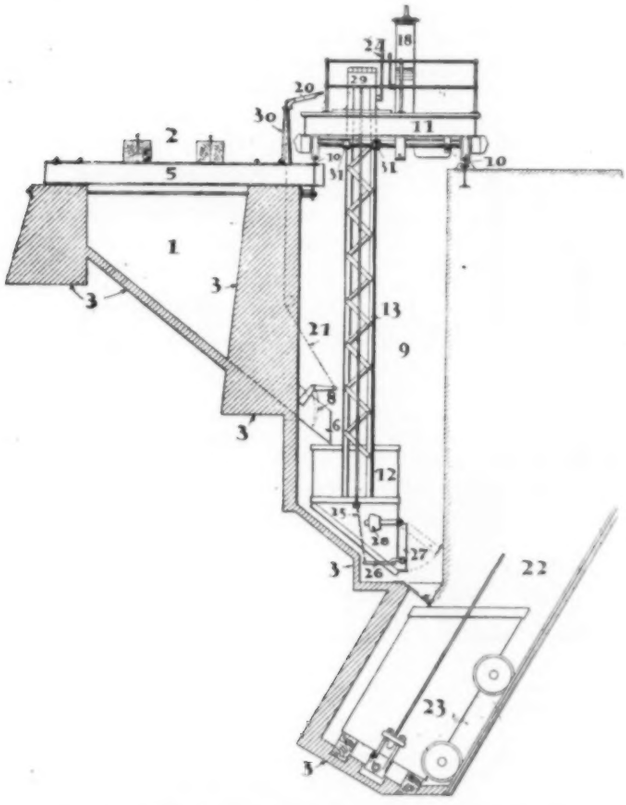


FIG. 1.—SECTION OF STOCK-BINS, CARRIER AND SKIP PIT.

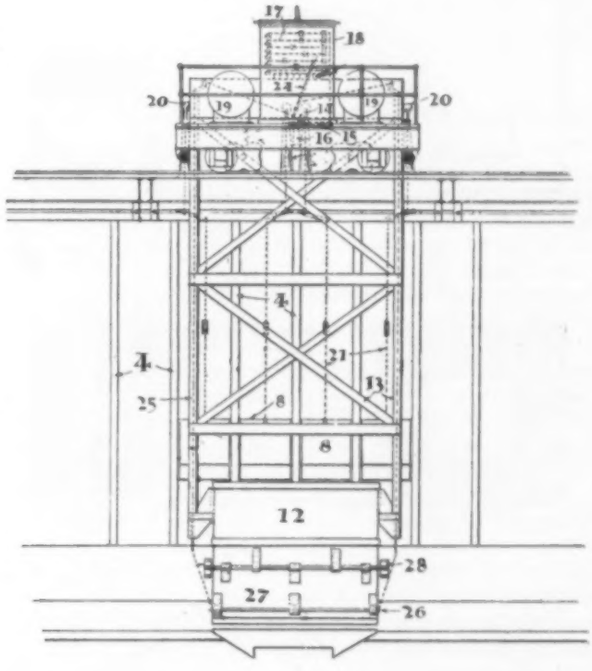


FIG. 2.—END ELEVATION OF CARRIER.

THE present effective fighting force of the United States Navy, says Secretary Long, in his annual report, consists of four battleships of the first class, two battleships of the second class, two armored cruisers, 16 cruisers, 15 gunboats, six double-turreted monitors, one ram, one dynamite gunboat, one dispatch boat, one transport steamer, and five torpedo boats. There are under construction five battleships of the first class, 16 torpedo boats, and one submarine boat. There are 64 other naval vessels, including those used as training, receiving, and naval reserve ships, tugs, disused single-turreted monitors, and some unserviceable craft.

THE Frontier Iron Works, Detroit, Mich., is introducing an improved upright gasoline engine for 10 h. p. or less and it will be placed on the market within 60 days. For plants requiring from 10 to 100 h. p., the standard Hicks compound engine will still be sold. The company formerly confined itself to milling interests, but is now prepared to furnish estimates for gas and gasoline engines for all purposes.

WORKING IN MALLEABLE IRON.

Wrought iron, cast iron and steel have been harnessed to man's service from time immemorial, but useful as this trio have proven themselves to be, there was still one missing link in the iron chain. That link was found and the grand chain completed when malleable cast iron was discovered, and its use inaugurated in the industrial world. One authority, in speaking of malleable iron, says: "Some means of arriving at the same result appear to have been known to the iron-workers in the middle ages, as there are numerous examples of malleable castings to be found in old buildings." All seem to agree, however, that the credit of introducing it in modern times is due to Samuel Lucas, of Sheffield, Eng., who, in 1804, obtained a patent "for a method of separating the impurities from crude or cast iron without fusing or melting it, and of rendering the same malleable and proper for several purposes for which forged or rolled iron is now used; and also by the same method improving articles manufactured of cast iron, and thereby rendering cast or crude iron applicable to a variety of new and useful purposes." It is only within the last quarter of a century, however, that it has developed to its present position of importance in the iron industry. When first it came into use it was confined to small, light work; but year after year its scope has widened till today it is taking the place of gray iron in work that formerly

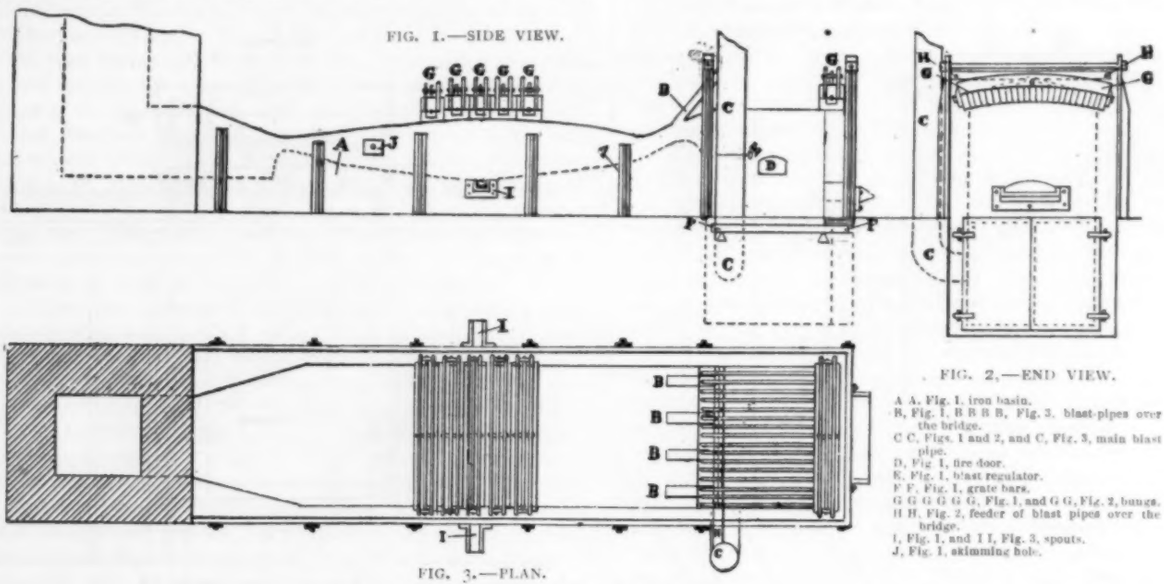


FIG. 1.—SIDE VIEW.

FIG. 2.—END VIEW.

FIG. 3.—PLAN.

A A, Fig. 1, iron basin.
B, Fig. 1, B B B B, Fig. 3, blast-pipes over the bridge.
C C, Figs. 1 and 2, and C, Fig. 3, main blast pipe.
D, Fig. 1, fire door.
E, Fig. 1, blast regulator.
F F, Fig. 1, grate bars.
G G G G G G, Fig. 1, and G G, Fig. 2, bungs.
H H, Fig. 2, feeder of blast pipes over the bridge.
I, Fig. 1, and I I, Fig. 3, spouts.
J, Fig. 1, skimming hole.

MALLEABLE CAST IRON FURNACE.

of the sketch accompanying this article, which represents a furnace of about five tons capacity. The furnace is built of fire-brick, encased with iron plates and held in place by iron stanchions or rails. The bottom is also of fire-brick conforming to the shape of the dotted line in Fig. 1. Between points A A, however, being the reservoir for the melted iron, a fire sand bottom is put in, sloping from both sides towards the spout which is the lowest point. The charging is done by removing two or more bungs (G G G G G G G, Fig. 1), by means of a block and tackle suspended from a rail running lengthwise over the furnace. The bungs are an arch of fire-brick (G G, Fig. 2), clamped together in an iron frame; these are placed side by side and form the top of the furnace to the chimney wall, the sketch shows only six in position. The blast passes down the wind-pipe, C C, and enters the fire box from beneath. This drives the flame and heat violently towards the sloping roof of the furnace, which deflects it through the narrow passage between the bridge and the bungs. Here it is met by the blast from four tributary wind-pipes (B, Fig. 1 and B B B B, Fig. 3), which plays fiercely on the charge distributed in the wider part of the furnace, thence through the narrowing passages to the chimney. The shape of the interior of the furnace, it will be seen, is devised with a view to taking the greatest possible advantage of the heat.

As will be readily understood, this process changes the carbon in the iron from a graphitic to a combined form; and in-

it was thought impossible to make it malleable. Its usurping qualities have not been confined in their operation to the field of cast iron alone, for it has also invaded the domain of wrought iron and steel. So much has this been the case, that this intermediary between cast and wrought iron has become indespensable in the manufacturing world to-day.

The first question that might be asked is, what pig iron is used to make malleable? Originally only charcoal irons were used, but later experiments have demonstrated the availability of Bessemer pig iron. An authority on these matters informs me that the iron best adapted for malleable should be low in all metalloids except carbon; silicon being about 1.25 per cent, which would cause about one-third of the carbon to be in the combined form.

The melting of malleable is done both in the cupola and the reverberatory furnace. For small work where a uniform, superior metal is not absolutely necessary, the cupola can be used to advantage, but it is impossible to turn out a uniform grade of metal from it. The reverberatory furnace is, however, best adapted for all kinds of work; hence the great bulk of malleable iron is run from these furnaces. The iron does not come in direct contact with the fuel as it does in the cupola, and is therefore less liable to be affected by it. The fuel used is usually a good, close bituminous coal, although some types of furnaces are adapted to the use of oil or natural gas.

A fair idea of the blast furnace will be acquired by a study

sures a thorough mixing of the iron before it is tapped out. A charge of five tons is usually melted in about 3½ hours with good fuel. After the iron becomes fluid it is skimmed through a slag-hole (J, Fig. 1), provided for that purpose in the side, and, just before tapping out, this operation is repeated. It now becomes necessary to test the iron. This is done by dipping out a little iron and pouring it into a round bar about 1⅔ inches thick and 6 inches long. This is carefully cooled in water and broken; if the fracture shows clear white and free from little black specks it is said to be "high" enough and, therefore, ready for pouring. If the black specks or a dark color show in the fracture it must be given further time in the furnace. When the test shows that the iron is right no time is lost in tapping it out, and pouring it, for when it reaches the desired point it has a decided tendency to go back.

When tapped out at both sides of the furnace for "shank" and hand ladles, a 5-ton heat is usually run out in about 20 minutes. As soon as the tap is run out the bungs are lifted off and the charge for the next heat is put in. This is also lively work. The charge is piled ready beside the furnace and is passed from hand to hand by a row of men. First the sprues and scrap are dumped in, then follows the pig iron and inside of 15 minutes the charge is in, the bungs replaced ,and the flames roaring over and through the iron. It was at oen time thought to be impossible to secure a good quality of cast malleable iron if old annealed scrap iron were used in

the charge, but that day is past and the large piles of old scrap that lie around the country are being rapidly converted into good malleable castings. When the iron is poured it is at a white heat—the high temperature being necessary to hold the carbon in combined form and, as it falls into the ladle and is conveyed to the mold, bright scintillating sparks are given off.

When the castings are taken out of the sand they are extremely brittle and show a clear white fracture. They are then cleaned either by tumbling in a mill or by pickling in diluted sulphuric acid and are ready for the annealing pots. In these pots the castings are packed with fine iron turnings that have been sprinkled with sal ammoniac to form an oxide of iron. The packing must be carefully done, for not only does it assist in preventing fusion, but it prevents the castings from being twisted out of their original shape when they become plastic under the intense heat to which they are subjected. The pots are then placed in the annealing oven which is hermetically sealed and the fires kept going night and day for a period varying according to the weight of the castings to be annealed. The pots are kept at a cherry red heat. Five days is about the average time given, then the ovens are allowed to cool off gradually and the pots taken out and the castings removed. To remove the bright blue surface discoloration the castings are again put in the tumbling barrels. After annealing, the castings, that were originally as brittle as glass, will be found to be as pliable and tough as wrought iron, and there are instances where it has stood welding; thus clearly demonstrating that it has left the field of cast iron by the annealing process, which is really the art of changing the combined carbon in the castings back to the graphitic state, but distributed throughout the iron in atomic particles, rather than in the form of crystals, as is found in gray iron.

And now, a word about the molding for cast malleable. The unforseen largely enters into any class of molding, but more especially so can this be said in this case. Its liability to crack, to shrink, to honeycomb, to blubber, to misrun, to coldshut, or blow, keeps the molder guessing or experimenting right along. No matter how successful he may have been on a job once, the next time he gets it all his past experience may not avail, but entirely different methods have to be pursued. While the ramming and pouring might be the same, the results are not; it will, perhaps, crack or shrink in some unaccountable manner, that will necessitate a complete change of tactics. For some reason that the writer cannot explain, a mold prepared for malleable iron will not stand the hard ramming that is required for gray iron without blowing. While the molten iron, because of its intense heat and consequent fluidity is of a most searching character, it does not seem to exercise as great a strain upon the mold and a perfect casting can be turned out from a mold rammed so soft that gray iron being poured into it, it would have produced a most unsightly object.

One of the most essential things in preparing a mold is to place chills to prevent cracking, drawing or shrinking. Some years ago this feature did not so largely enter into the molder's art, but to-day competition has become so keen that the price paid for the castings does not warrant the use of the superior grades of iron that formerly obtained. The molder, then, is required to counteract natural results by artificial methods, and, to the unanitiated, the number of chills used in the molding of some pieces would be indeed astonishing, as would also the heads and shrinkers used on work that has heavy parts. No specific rule can be laid down for the placing of chills and shrinkers, the molder finding out by actual experiment, guided of course by experience.

In pouring work having heads or risers, you stop pouring in the runner-gate as soon as the iron appears in the riser, and flow the iron back through the riser, so as to keep the iron hot and feed the casting in the desired spot as long as possible. To prevent the chills from burning to the casting, various methods are adopted, such as facing them with shellac or oil and parting sand; but where the work is heavy there is nothing superior to a good coat of wash made from fire-clay, applied when the chills are warm.

The sand and iron used are, of course, the essential factors in determining the appearances of the castings. The sand must be selected according to the character of the work to be made—the fine sand necessary for the small work would be entirely out of place for draw-bars or other heavy work. While in some shops it is customary to use facing-sand and plumbago on fairly light work, the fact remains that in one of the largest malleable iron foundries in the country, and one which has a reputation for turning out castings that are second to none, facing-sand is only used at the gates or where the continual flow of iron would cause "cutting," except on the heaviest class of work; while plumbago or blacking is not used at all. This has demonstrated to my satisfaction that good sand and good iron obviate the necessity of extra precaution and expense in order to turn out castings with a clean, smooth skin.

Although malleable iron, under the most favorable conditions might fairly be classed as "tricky," it is a well known fact that its trickiness has increased since old annealed scrap has found its way into the charge. While this innovation has undoubtedly cheapened the product, it has made the work of the molder more uncertain, for its influence on the fluid iron seems to render it more liable to give trouble from blowing, honeycombing or cutting the mold; and to overcome these evil developments the resources of the molder are taxed to their fullest extent. With this must also be considered the great variety of work and its greater size and weight than was made a few years ago. Its progress in this respect is simply astonishing. As its usefulness and serviceability become better known and understood, new fields are ever being opened up for it, and it seems as if malleable cast iron were destined to play a still more important part in the iron industry of the future.—[Iron Molders' Journal.

Progress Toward Foundrymen's Protective Association.

A well attended meeting of foundrymen was held at the Grand Hotel, New York, Dec. 1, at which Mr. H. W. Pfahler, of Philadelphia, chairman of the special committee appointed by the American Foundrymen's Association, at Detroit, last May, reported the progress that had been made in the movement for a uniform method of settling the disturbances that continually occur between foundrymen and their employes. As is well known, considerably higher wages are paid in some sections than in others, and in addition there is great diversity in methods of settling disputes, might being the power usually recognized on both sides. The result has been a continual "whip-sawing." First one locality seems to have the advantage and then another, and all the time each employer imagines his competitor is doing better than himself.

Mr. Pfahler made an able address at the New York meeting and every one present spoke in favor of the formation of the organization proposed. As a result some appropriate resolutions were drawn up and will be sent to leading foundrymen of the country for signatures. A sub-committee on constitution and by-laws has also been appointed, consisting of Francis Schumann, Tacony Iron & Metal Co. and W. H. Pfahler, Abram Cox Stove Co., Philadelphia; A. J. Caldwell, Henry R. Worthington, Brooklyn, N. Y.; Richard C. Oliphant, Trenton Malleable Iron Co., Trenton, N. J.; Walter Perry, Farrell Foundry & Machine Co., Ansonia, Conn.; Chas. L. Newcomb, the Deane Steam Pump Co., Holyoke, Mass.; M. F. Moore, the S. L. Moore & Sons Co., Elizabeth, N. J. This committee will meet in New York the latter part of the present month, and it is expected a general meeting of all the foundrymen in the country will be called for the formal organization of the association some time in January.

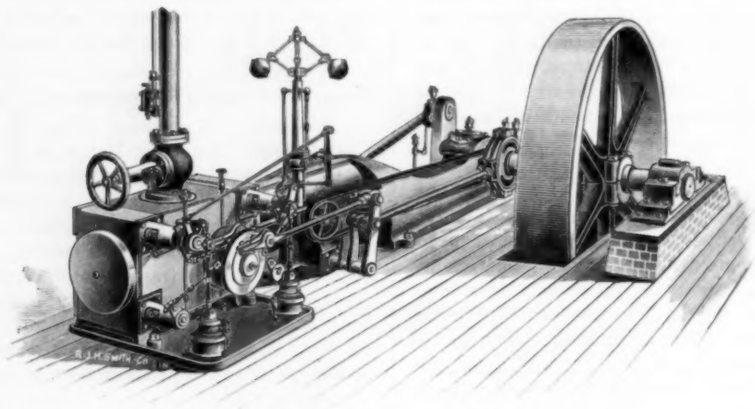
London *Ironmonger*, Nov. 27: "Mr. Walter Wood, of R. D. Wood & Co., of Philadelphia, who was in this country a few weeks ago, has crossed over, stayed a few days only at home, and is now back on this side. When he was here before he managed to secure a portion of the Glasgow order and a lot of 800 tons for Axbridge, Somerset. He is now hunting for other orders, and will go very near getting some of them unless our Scotch friends can underbid him. A lot of 125 tons of American cast iron pipe is coming over in the Michigan, now about due here, for use in London."

The Sessions Foundry Co., Bristol, Conn., has been tearing down some of its old buildings and shipping to its new plant.

THE HEILMAN CORLISS ENGINE.

The accompanying cut illustrates a Corliss engine as built by the Heilman Machine Works, of Evansville, Ind. The general design is the result of careful study of this class of engine by the builders and it was the special aim to meet the increasing demands for greater rigidity and strength and durability of wearing parts, compactness being a strong feature.

The distance between the center of shaft and foundation is shorter, the builders claim, than in other Corliss engines, of the same size. This lessens the strain on the foundation by reducing the tendency to rock endwise, communicated by the momentum of the reciprocating parts. The frame proper, from the guides back, including the main journal and surrounding the crank, is of the box form, well braced internally and with broad bearing on foundation. The box of the main bearing is semi-circular, permitting it to be quickly removed without taking the shaft out. The guides are of the circular enclosed form, cast solid in the frame; back of the guide piece is a heavy box-shaped rib, or back-bone, extending from the frame to the cylinder, uniting in a direct line and resisting the strain of the engine as transmitted from the piston to the shaft. The guide piece has also a large foot resting on the foundation, which gives additional support and strength to the guides. The cylinder is made extra heavy and is placed on a sole plate, which extends far enough out to receive the dash pots. All valves in the cylinder are double-ported and are operated by standard hook releasing gear. The dash pots are dust proof, quick acting and noiseless. The governor is of the ball type, provided with weighted lever and safety stop. The engine is built with one or two eccentrics, as desired.



THE HEILMAN CORLISS ENGINE.

THE Pittsburg Woven Wire Fence Co. will apply on Dec. 29 for incorporation. The incorporators are John H. Silliman, Orrin W. Sadler, Biddle Arthurs, David K. Boas and Jacob Schumacher. The company, which is now a limited partnership, has a factory at Smallman and 32nd streets for manufacturing wire fence.

THE Benjamin Atha & Illingworth Co., Newark, N. J., has a contract from the Government for the construction of 30 4-inch breech-loading rapid-fire rifles. The first gun is to be delivered in 120 days, and the 30 in about 15 months.

A RECENT catalogue of the Burgess Steel & Iron Works, Portsmouth, O., gives prominence, by means of half-tone illustrations and details of tests, to the 5-ply welded steel and iron bars, plates and angles for safe, vault and jail work. The comparison, in all the tests given, is with Chrome steel.

THE Berlin Iron Bridge Co. gave the fifth annual oyster roast to its employes and their families at its works in East Berlin, Conn., on Wednesday evening, Dec. 15, beginning at six o'clock.

SOUTHERN roads are agitating an advance in pig iron rates.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants :—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our davertisers at once.]

The power plant of the Old Meadow Rolling Mill Co.'s new sheet mills, at Scottdale, Pa., will consist of a 36x60 Corliss engine, eight 66" x 18' boilers, of the regular horizontal tubular type, pumps, heaters, etc. Among the machinery needed on which bids will be asked, are three 126-inch squaring shears, roll lathes, vertical shears, machine tools, etc.

"H," care *The Iron Trade Review*, desires to be put in communication with manufactures of acetylene gas machines.

At Columbus, O., the Turner Engineering Co., of Marion, was incorporated, Dec. 8, by George E. Turner, James C. Tobias and six others. Capital, $100,000. They will make and sell boilers, machinery, car trucks and construct and equip railways.

At the office of the Supervising Architect, Washington, D. C., sealed proposals will be received until 2 p. m., Jan. 3, 1898, for all the labor and materials required to erect complete, ten freight elevators, two passenger elevators, one package elevator and one ash lift (either electric or steam) for the U. S. Apprasiers' Warehouse, New York, N. Y.

The A. A. Browne Novelty Mfg. Co., San Antonio, Tex., wants a good second-hand back-gear screw-cutting engine lathe, six or eight-foot bed, 18 to 22 inch swing; also a power press to correspond to a Bliss No. 20, about 7x9 opening.

George Peacock, Selma, Ala., will buy a new or good second-hand engine lathe about 28 to 30-inch swing, that will turn six or seven feet between centers; a substantial tool, with not less than three-inch belt power, and not over 14 feet in length over all.

New Construction:—

Architects Haslom & Lockhead are preparing plans for a machine shop and office for H. G. Johnson & Co., Corsicana, Tex. Mr. Johnson will shortly begin the erection of a large foundry building.

The Flushing Gas & Electric Co., of Flushing, L. I., have placed the contract for the extension of its generator plant with the Berlin Iron & Bridge Co., of East Berlin, Conn. It will be of fire-proof construction, having steel framework and trusses covered with currugated iron roofing.

A machine shop will be built at Corsicana, Tex., by H. G. Johnson & Co.; building to be 78x81 feet, with machine shop, smith and boiler rooms, etc. A foundry building and equipment will be provided later.

The Schuylkill Valley Steel Co. has been chartered at Harrisburg, Pa., with $200,000 capital. The erection of the plant at Birdsboro will begin soon.

Robert J. Scott and others, of Pittsburg, are planning for the erection of a 6-mill tin plate plant, to be increased later to 8 or 9 mills. An option was secured some time ago on a tract of land midway between New Castle and Mahoningtown, Pa., and the mill will probably be erected there, or at some point not far up the Monongahela River.

The American Ax & Tool Co., of New York, has had plans drawn for two four-story brick buildings, one three-story and

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a two-story building, engine and pump house, boiler house, electric plant and office building. The whole will constitute a new plant to cost $200,000. Various sights around Pittsburg have been inspected but none has been chosen as yet.

The Keystone Bridge Works, Pittsburg, has resumed the work of doubling the tracks of the Pittsburg & Lake Erie bridge and viaduct at Beaver, Pa. The work was begun two years ago and will now be pushed to completion.

Haeberle Bros., have been awarded the contract for constructing the temporary plant of the Acetylene Gas Machine Co., of Niagara Falls, Ont., which is to be erected at Niagara Falls, N. Y.

It is reported that the Cornwall & Lebanon Ry. Co. will erect car shops at South Fork, near Johnstown, Pa.

A plant for the manufacture of car wheels is to be built in Allegheny, it is reported, with a capacity of 85 tons a day. Several sites are under consideration. Joshua W. and J. D. Rhodes, of Allegheny, are interested in the new company, which will be incorporated soon, with $100,000 capital.

Additions, Enlargements, Removals, Etc.:—

The National Malleable Castings Co., has purchased 16 acres of land between 93d and 95th sts. and Drexel and Greenwood aves., Chicago, and it is reported will erect a foundry in the near future.

The Minneapolis Rolling Mills, Minneapolis, Minn., will erect a building 80x150 for the manufacture of open-hearth steel. It will be built entirely of iron and steel and cost $100,000. A. D. Arundel, superintendent.

The Minnesota Thresher Co., of Stillwater, Minn., is preparing to make extensive improvements to its plant and enlarge the same.

The Alabama Foundry & Machine Works, New Decatur, Ala., will enlarge its plant; $10,000 will be expended on improvements.

A machine shop has been added to the equipment of the Mountain Iron mine at Mountain Iron, Minn. It is 40x60 feet and will contain a planer, lathes and other machinery for use at the mine.

The Donaldson Iron Co., at Emaus, will build a new pipe foundry with three pits. The building will be 50x86 feet.

At Chattanooga, Tenn., the Converse Bridge Co. will extend its plant and increase capacity. Work has begun on a new building, 40x40 feet. New machinery will be installed.

Fraser & Chalmers are moving the various departments of their Chicago plant to the vicinity of their immense foundry on West 12th st., and Washtenaw av. The new plant will have a floor space of 160,000 sq. ft., and will cost over $500,000. The factory yard will be 762x796 ft. Over 1,000 men will be employed when all departments are in running order, which will be as early in the new year as the rush of business will permit. The old buildings contained but 75,000 sq. ft. of floor space, and were quite too small.

It is reported that the Schenectady Locomotive Works plant will be increased by erecting a new brick addition, 76x280 ft., to be used as a tank and paint shop.

The Chicago Insulating Wire Co., Sycamore, Ill., will build an extension to its factory and equip it for drawing wire.

The Cambridge Iron & Steel Co., of Cambridge, O., manufacturers of galvanized and black sheets, have decided to enlarge their plant by adding four additional trains of sheet rolls, consisting of two sets of finishing rolls, one set roughing and one set cold rolls. The specialty of the company is galvanized sheet iron.

The Pennsylvania Tin Plate Co., of New Kensington, Pa., are erecting two new hot mills and two stands of cold rolls. The tin house is also being enlarged.

The Westmoreland Malleable Iron Co., Westernville, N. Y., is building an addition to its molding room.

The new tin plate works of the Laughlin Nail Co., at Martin's Ferry, O., is to be an 8 instead of a 6-mill plant, as original plans called for.

The Boston Electric Conduit Co., now operating a plant at Versailles, near McKeesport, Pa., will remove to Beaver Falls, Pa., and occupy a part of the plant of the McCool Tool Co., with whom there has been for some time close working relations.

The improvements which are now being made to the plant of the Reading (Pa.) Crane & Hoist Works, consist in moving the present plant into larger quarters, now in course of erection near the Philadelphia & Reading tracks. The cost of the new building will be $16,000.

An extension to the Standard Steel Works, Burnham, Pa., will be built, one story and 70x100 ft. Wm. Steele & Son, Philadelphia, are contractors.

Fires and Accidents:—

At Smethport, Pa., Dec. 11, Masser's carriage, blacksmith and bicycle shops, and Purtel's carriage, wood-working and bicycle plant were burned. Loss $15,000, partly covered by insurance.

The breaking of a bolt in a connecting rod of the big blooming mill engine at the Johnson Co.'s plant, Lorain, O., last week, and the fracturing of the rear cylinder head caused a shut-down for several days.

The Davis & Farnum Foundry, Waltham, Mass., was destroyed by fire Dec. 2. The loss is about $12,000; insured.

General Industrial Notes:—

There is no probabilty of such a consolidation of the Walker Co., of Cleveland, the Ft. Wayne Electric Co., and the General Electric & Westinghouse interests, as recently reported. August Belmont is a trustee of the Westinghouse Electric & Mfg. Co., but has no interest in the Walker Co., his brother Perry Belmont, having some stock in the latter.

The wholesale hardware house of Horton, Gilmore, McWilliams & Co., of Chicago, made an assignment to the Illinois Trust & Savings Bank on Dec. 8. The liabilities are estimated at $210,000, and the assets at $300,000. Previous to the assignment the entire stock of hardware of the company was sold to Hibbard, Spencer, Bartlett & Co., the terms of the sale being private as yet. The encroachment into the hardware business by concerns engaged in other lines has effected the general hardware trade to a large extent lately, and the insolvent concern suffered from this cause. For 12 years the corporation has been in business in Lake st., in its present location, and it probably had the largest city trade of any of the wholesale hardware houses in business in Chicago. It was the successor of the old firm of William Blair & Co., one

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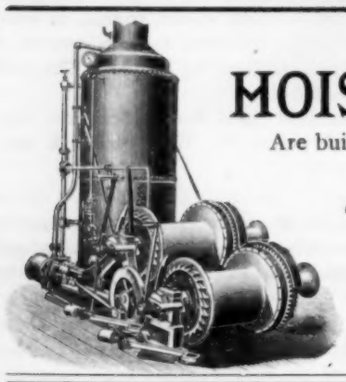

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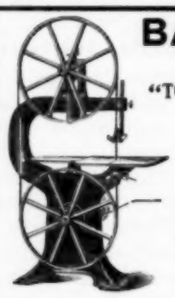

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of the pioneers in the hardware business in that city. Four weeks ago, John Alling & Co., another pioneer hardware house, also sold out to Hibbard, Spencer, Bartlett & Co.

The shovel works of H. M. Myers & Co., at Beaver Falls, Pa., started up this week on full time in all departments.

A new laboratory, which takes the place of the old one destroyed by fire last year, has just been completed at the Edgar Thompson plant, Braddock. The building, with its equipments, is estimated to have cost $20,000.

The Pittsburg Valve & Machine Co., Ltd., of Allegheny, will handle the Laidlaw-Dunn-Gordon pump in connection with M. Greenwood, of the Carnegie Bldg., Pittsburg.

The Pennsylvania Tin Plate Co., of New Kensington, Pa., expects to have in operation about Jan. 1, two new hot mills, of the latest design, making six hot mills, and two new stands of cold rolls, with additions to the tin house to accommodate the increased output of these mills.

Fannie Furnace, at West Middlesex, Pa., will resume operations shortly after being idle more than 18 months.

The Bellaire (O.) Stove Co. has decided to double its output, and 60 additional men will be put at work.

The Elliott-Washington cold-rolled steel plant at New Castle, Pa., had the largest month's tonnage in its history in November. More men were employed than ever.

The Vulcan Iron Works, of Toledo, O., has just declared a dividend of 20 per cent and an extra dividend of 6⅔ per cent.

The Pennsylvania Steel Co. will begin soon the rolling of 2,000 tons of steel rails for shipment to Australia.

A purchase of 1,000 acres of coal land in German tp., near Uniontown, Pa., is reported to have been made by Frank J. Hearne, of the Riverside Works, Wheeling. Coal will be shipped to Wheeling.

At its recent annual meeting the following were elected officers of the Central Iron Works, Harrisburg, Pa.: Chas. L. Bailey, president; James M. Cameron, vice-president; G. M. McCauley, treasurer and general manager; S. B. Baude, secretary.

The Reading Iron Co., will erect four new Massicks & Crooke's patent fire brick hot blast stoves at its new furnace plant. The stoves will be of the three-pass type with latest improvements.

A recent 10-hour output of the New Castle Wire Nail Co.'s rod mill was 417,000 lbs. This was outdone by the crew on the other turn, who made 441,000 lbs.

There is some agitation of a new blast furnace project at Harriman, Tenn., in which Northern capital is said to be interested. W. T. Smith, Harriman, is named in connection with the project.

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SECOND-HAND MACHINE TOOLS.

If so, advise us what you have or want.

For NEW MACHINERY of all kinds, write or call on us.

We have a large stock, and can fill orders promptly.

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THE ANDREW PATENT GRIP SOCKET.

Holds straight or taper shank drills perfectly rigid. Protects the Shank until the drill is completely worn out. Old taper Shank drills with tangs broken off used just as well as new drills. Beware of infringements.

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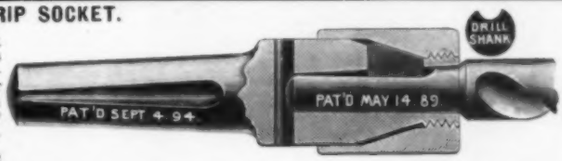

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Manufacturers of reworked boiler tubes
Good second-hand tubes bought.

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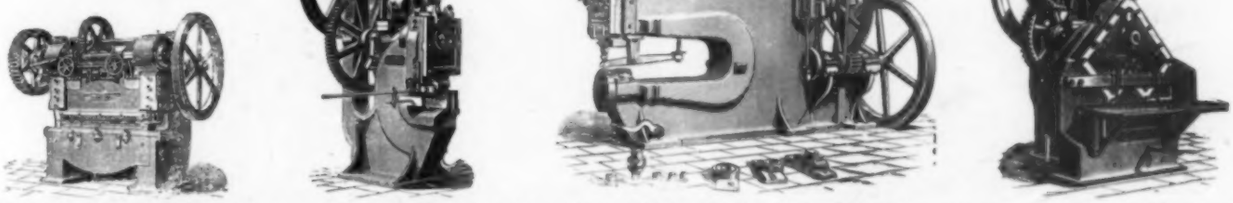


MANUFACTURERS AND EXPORTERS OF POWER PUNCHING AND SHEARING MACHINERY ADAPTED TO ALL PURPOSES FOR BOTH HEAVY AND LIGHT WORK.

At Carrollton, Ga., J. M. Walker and R. E. Carroll will operate a foundry and machine shop.

The Lalance & Grosjean Mfg. Co.'s mills, at Harrisburg, Pa. are running on full time in all departments. The output for November was the largest in the history of the company.

Furnace No. 3, of the Colorado Fuel & Iron Co., Denver, Col., was blown in Nov. 26.

A brief description of some features of the big Union Iron Works at San Francisco, is given by a correspondent of the *Engineering News:* "The working force on Nov. 26 was at just 3,000 men. The pay-roll amounts to $150,000 a month. The machine tools purchased or made and placed during 18 months past are valued at $600,000. They have been selected all over this country and some of them from abroad. Our rounds wound up in the store rooms, and here one may find a stock not equalled in the world. These works are 3,000 miles from the markets where supplies can be drawn as needed, hence there is the choice of making everything possible, or keeping a large stock on hand. Nearly everything is made. Electrical machinery and nearly all equipment goods are prepared. Cocks, valves, screws, indeed everything of metal, from a few ounces up, is prepared on the ground. The stores of both the purchased and manufactured goods on hand are a wonder. We passed a pile of small boxes. It was a car load of candles. We turned into a small room about 10 ft. square, shelved all around and filled with brass flanges, faced and bored ready for use. Mr. Dickie remarked that the company ran out of brass flanges recently and had just made up a stock of 50 tons of the smaller sizes, worth about $25,000. The flanges were for soldering mainly and are nearly pure copper."

Locomotive and car building: A Russian engineer is on his way to the United States with specifications for 400 locomotives to be placed soon by the Russian government. The C., B. & Q. is considering placing orders for 25 engines. The Rogers Locomotive Co., Paterson, N. J., has an order for 11 passenger and four mogul locomotives for the Sango Railroad of Japan. The Evansville & Richmond road has just ordered three locomotives; the Louisville, Henderson & St. Louis, 2; the Iowa Central, 2; the Big Four, 6 (with Brooks Locomotive Works); the Pittsburg, Bessemer & Lake Erie, 6. The C., M. & St. P. is asking bids on ,500 box cars; Long Island Railroad for 20 combination cars; Pittsburg & Lake Erie, for 1,000 coal cars; Lake Shore & Michigan Southern, on 500 cars, probably early in 1898; Indiana Tank line for 10 tank cars. The Union Pacific, Denver & Gulf has ordered 50 refrigerator cars; New York, New Haven & Hartford has ordered 100 cars each from Wason Mfg. Co., Osgood Bradley & Sons and the Keith Mfg. Co. The New York, Ontario & Western will build 100 freight cars at its shops this winter. The C., H. V. & T. Railroad has closed for 500 box cars, 200 from the Michigan-Peninsular Car Co., Detroit; 150 from the Barney & Smith Car Mfg. Co., of Dayton, O., and 150 from the Ensign Mfg. Co., of Huntington, W. Va.

The Crane Iron Co., Catasauqua, Pa., will soon blow in another furnace.

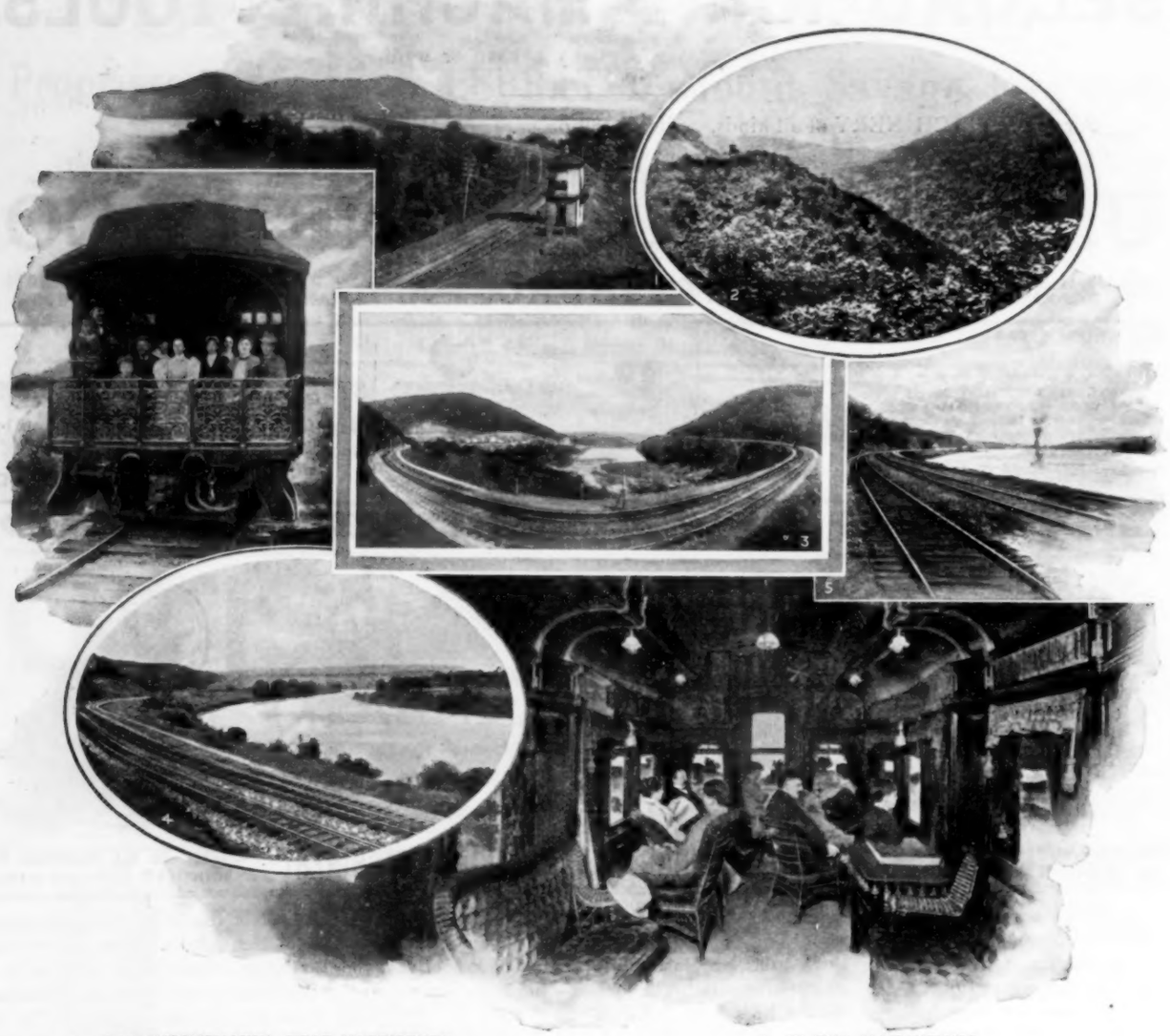
EXCURSION RATES.

Via Pennsylvania Lines for Christmas and New Year.

Following the annual custom, Ticket Agents of the Pennslyvania Lines will sell excursion tickets Dec. 24, 25 and 31, 1897, and Jan. 1, 1898, for the Christmas and New Year holidays. Tickets will not be sold to adults for less than 25 cents, nor to children for less than 15 cents. Return limit of excursion tickets will include Jan. 4, 1898. For rates, time of trains, and further information please apply to nearest Ticket Agent of the Pennsylvania Lines.

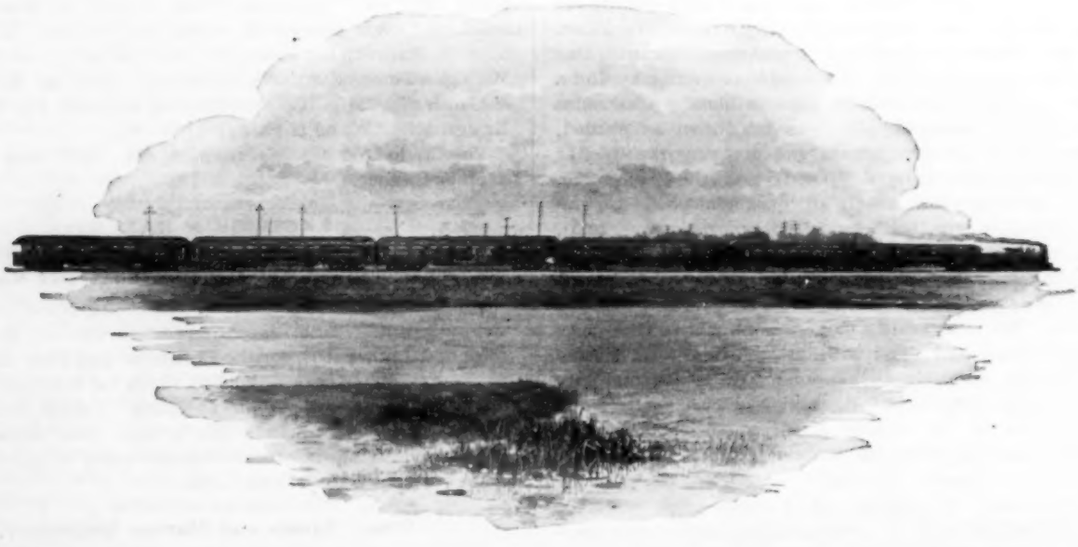
Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*



1. THE SUSQUEHANNA NEAR HARRISBURG. 2. IN THE ALLEGHENIES.
3. HORSE SHOE CURVE.
4. THE BLUE JUNIATA. 5. OHIO RIVER NEAR PITTSBURGH.

FROM THE OBSERVATION CAR.



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Runs as freely as an ordinary rope tackle block. Holds more securely than a chain block. Locks instantly and does not cut the rope. Allows the load to be lowered safely and slowly, the operator using only one hand. Can not stick nor jam when the load is to be lowered.

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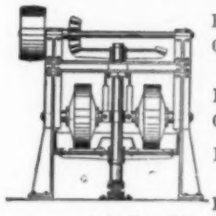

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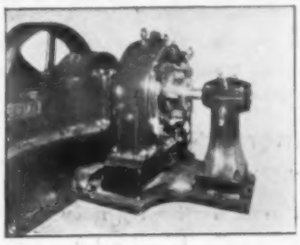

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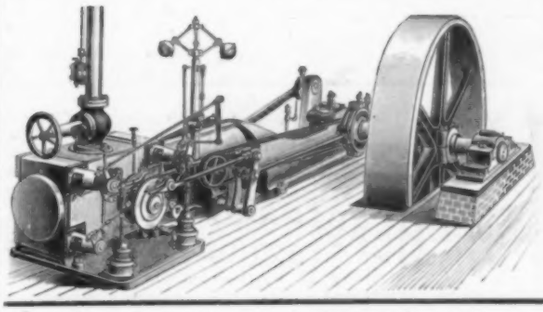

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‡Daily except Saturday. ‖Saturdays only.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:10 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:40 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:50 am	* 5:30 pm
Akron and Columbus	* 8:50 am	* 5:30 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Col. Cin. Ind. & St. L.	‖ 8:00 pm	* 7:30 am
Col. Cin. Ind. & St. L.	‡ 11:20 pm	

The Cleveland Terminal & Valley R. R. Co.
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Depot foot of So. Water St. City Office 241 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:20 P M	*7:10 A M
Akron, Canton & Valley Jct	*10:05 A M	*3:30 P M
Akron, Canton & Chicago	*8:10 A M	*6:45 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:25 P M	†11:00 A

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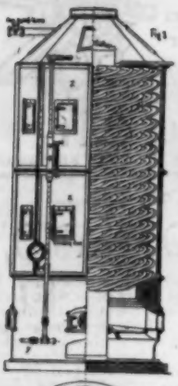

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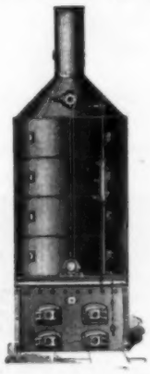

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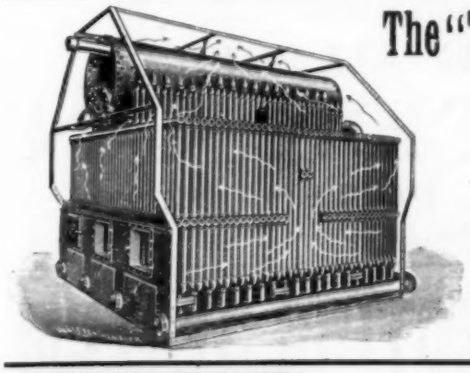

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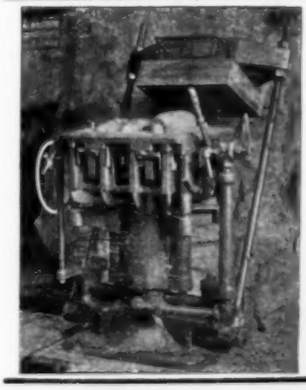

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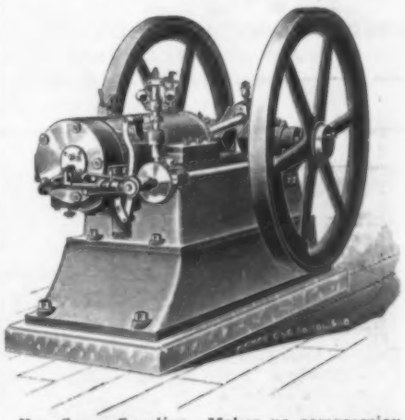

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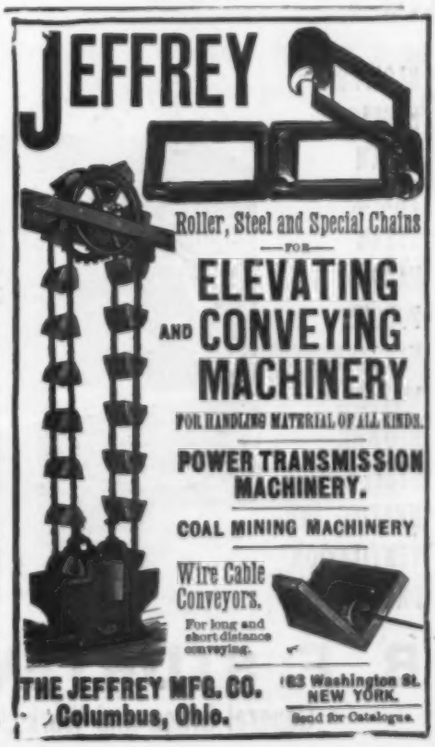

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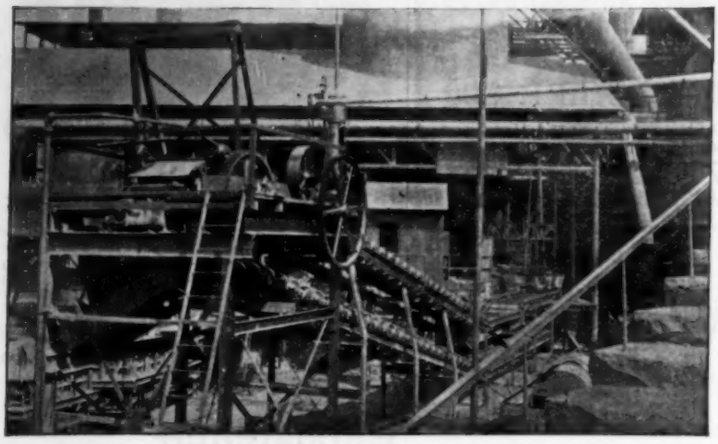

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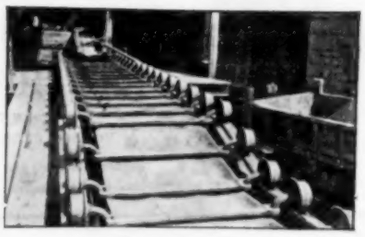

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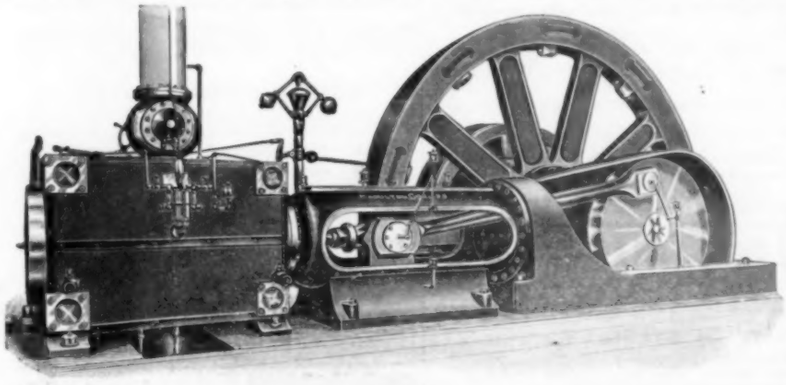

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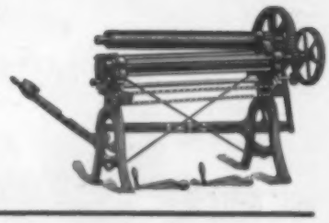

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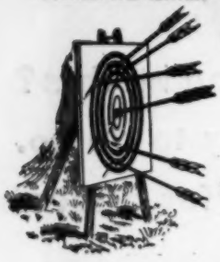

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Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co., Johnstown, Pa.
R. H. Stroud & Co., Chicago, Ill.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport O.

Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Clevelan,d
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Chas. F. Rand. Prest., New York City.

Iron Working Tools—
Toledo Machine & Tool Co., Toledo, O.
H. Bickford, Lakeport, N. H
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
John Adt & Son, New Haven, Conn.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia
Wm. Glader, Chicago, Ill.
Fox Machine Co., Grand Rapids, Mich.
Wm. C. Thayer, Cleveland, O.
M. L. Andrew & Co., Cincinnati, O.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill
Heyl & Patterson, Pittsburg, Pa.

Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Wm. Glader, Chicago, Ill.

Lubricators—
The Lunkenheimer Co., Cincinnati, O.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Lodge & Shipley Machine Tool Co., Cincinnati
Wm. Glader, Chicago, Ill.

Machine Screws—
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.
Pittsburg Valve & Machine Co., Ltd., Allegheny, Pa.

Machinery and Tool Steel—
W. H. Bosworth, Cleveland, O.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Cambria Iron Co., Johnstown, Pa.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metal Stamping—
Oliver P. Clay Co., Cleveland, O.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.

Mining Machinery—
The Bucyrus Co., South Milwaukee, Wis.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Gates Iron Works, Chicago, Ill.
W. H. Bosworth, Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.

Motors—
Westinghouse, Church, Kerr & Co., New York City.
Westinghouse Electric & Mfg. Co., Pittsburg.
Card Electric Co., Mansfield, O.
Fisher Electrical Mfg. Co., Detroit, Mich.

Molding Machines—
Tabor Mfg. Co., Elizabeth, N. J.

Molding Sand—
Ohio Sand Co., Conneaut, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Gates Iron Works, Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.

Ore Screens—
A. J. Beckley & Co., Garwood, N. J.

Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.
A. J. Beckley & Co., Garwood N. J.

Phosphor Bronze Castings—
Lorain Foundry Co., Lorain, O

Pig Iron—
Pickands, Brown & Co., Chicago, Ill.
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
W. H. Bosworth, Cleveland, O.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill
Miller, Wagoner & Bentley, Chicago, Ill.
Rogers, Brown & Co., Cincinnati, O.
Superior Charcoal Iron Co., Detroit, Mich.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

Pipe
W. H. Bosworth, Cleveland, O.

Planers—
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.

Plates—
Enterprise Boiler Co., Youngstown, O.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Pneumatic Appliances—
Clayton Air Compressor Works, New York.

Portable Forges—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.

Power Presses—
Bertsch & Co., Cambridge City, Ind.
Long & Allstattar Co., Hamilton, O.

Power Transmission Machinery—
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.

Presses—
Toledo Machine & Tool Co., Toledo, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Long & Allstatter Co., Hamilton, O.

Pressure Reducing Valves—
W. H. Bosworth, Cleveland, O.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Pumps (Steam)—
The Edward P. Allis Co., Milwaukee, Wis.
Henry R. Worthington, Brooklyn, N. Y.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
W. H. Bosworth, Cleveland, O.
Pittsburg Valve & Machine Co., Ltd., Allgheny, Pa.

Punches—
Walker Bros., Lansing, Mich.

Pyrometers—
Edward Brown, Philadelphia, Pa.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Riveting Machinery—
Wm. H. Wood, Media, Pa.

Rock Drills—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

Rolling Mill Machinery—
The Lloyd Booth Co., Youngstown, O.

Roofs—
Shiffler Bridge Co., Pittsburg.

Safety Lift Blocks—
Burr Mfg. Co., Cleveland, O.

Sand and Chill Rolls—
The Lloyd Booth Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.

Saws—
Peter Gerlach & Co., Cleveland.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.

Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill.

Semi-Steel—
The King & Andrews Co., Chicago, Ill.

Shafting—
The Lane & Bodley Co., Cincinnati, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City Ind.
Toledo Machine & Tool Co., Toledo O.
Long & Allstatter Co., Hamilton, O.
Fox Machine Co., Grand Rapids, Mich.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland
Ætna-Standard Iron & Steel Co. Bridgeport O
E. H. Stroud & Co., Chicago, Ill.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O
Edwin Harrington Son & Co., Philadelphia.
Perkins Machine Co., Boston, Mass.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Shovels and Dredges—
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Otis Steel Co., Cleveland, O.
Miller, Wagoner & Bentley, Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.

Steel Castings—
W. H. Bosworth, Cleveland, O.
The King & Andrews Co., Chicago, Ill.
Otis Steel Co., Cleveland, O.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland
Bethlehem Iron Co., South Bethlehem,
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.

Stokers—
Playford Stoker Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Westinghouse, Church, Kerr & Co., New York City.

Tackle Blocks—
Burr Mfg. Co., Cleveland, O.

Tanks—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Williams Mfg. Co., Kalamazoo, Mich.

Tinning Machinery—
W. H. Bosworth, Cleveland, O.
The Lloyd Booth Co., Youngstown, O.

Tin Plate—
Ætna-Standard Iron & Steel Co., Bridgeport, O

Tin and Terne Plates—
B. P. Crane & Co., Chicago, Ill
E. H. Stroud & Co., Chicago, Ill.

Tool Steel—
C. H. Besly & Co., Chicago, Ill.

Transmission Machinery—
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.

Tube Welding—
S. Fix Sons, Cleveland.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
W. H. Bosworth, Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
The Lunkenheimer Co., Cincinnati, O.

Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.

Wheelbarrows—
Akron Cultivator Co., Akron, O.
Lansing Wheelbarrow Co., Lansing, Mich.

Wire Machinery—
John Adt & Son New Haven Conn.
Wm. Glader, Chicago, Ill.

Wire Nail Machinery—
Wm. Glader, Chicago, Ill.

The A B C of Iron.

A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

Former Price $2.00, NOW $1.00.

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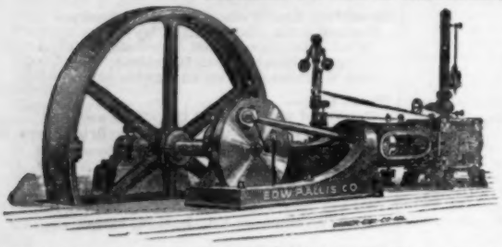
THE IRON TRADE REVIEW, 27 Vincent St., Cleveland, O.

THE IRON TRADE REVIEW

Is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

ICE and REFRIGERATING MACHINERY, Blowing Engines, Hoisting Engines, Pumping Engines Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills. Ore Crushers; Crushing Rolls, Stamp Mills Concentrators, General Mining Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO PITTSBURG.

Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3.40@3.46
No. 1 Specular, Bessemer	3.05@3.17
No. 1 Bessemer hematite	2.60@2.90
Hematites No. 1 non-Bessemer	2.00@2.25
No 1. Specular, non-Bessemer	2.40@2.60

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$ @10 15
No. 1 Strong Foundry	10 05@10 90
No. 2 Strong Foundry	10 15@10 40
Gray Forge, red short	9 15
Gray Forge, neutral	9 40
No. 1 American Scotch	10 75@11 00
No. 2 American Scotch	10 25@10 50
Lake Superior Charcoal	@12 00
PITTSBURG:	
No. 1 Foundry	$10 75@10 90
No. 2 Foundry	10 25@10 40
Gray Forge	9 25@9 40
White and Mottled	9 50
Warm Blast Charcoal	13 00@13 50
Cold Blast Charcoal	16 00
Bessemer	9 50
CHICAGO:	
Lake Superior Charcoal	$12 50@$13 00
Local Coke Foundry No. 1	11 00@11 50
Local Coke Foundry No. 2	10 50@11 00
Local Coke Foundry No. 3	10 25@10 50
Local Scotch Foundry No. 1	11 50@12 00
Local Scotch Foundry No. 2	11 00@11 50
Local Scotch Foundry No. 3	10 50@11 00
Southern Coke No. 1	11 00@11 25
Southern Coke No. 2	10 60@10 85
Southern Coke No. 3	10 35@10 60
Southern No. 1 Soft	11 00@11 25
Southern No. 2 Soft	10 60@10 85
Southern Silveries	11 25@11 50
Jackson Co. Silveries	12 50@14 50
Ohio Silveries No. 1	@
Ohio Strong Softeners	12 00@12 25
Alabama Car Wheel	16 00@17 00
Malleable Bessemer	10 75@11 00
Coke Bessemer	11 50@12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ 10 00
Southern Coke No. 2 and No. 1 Soft	9 75
Hanging Rock Coke, No 1	9 45
Hanging Rock Charcoal No. 1, Fdy	14 50@15 50
Tennessee Charcoal No 1	12 50@13 00
Jackson County Silvery No 1	12 50@13 00
Southern Coke, Gray Forge	9 25
" " Mottled	9 00
Standard Georgia Car Wheel	14 25@15 00
Tennessee " "	13 00@14 00
Lake Superior " "	14 25@14 50
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	11 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	10 75
Ohio Strong Softener No. 1	11 75
Jackson Co. Silvery No. 1	14 00
Lake Superior Charcoal	15 50
Southern Soft No. 1	11 75
Hanging Rock Charcoal	17 00
ST. LOUIS:	
Southern Coke No 1	$10 50@$10 75
Southern Coke No. 2	10 25
Southern Coke No. 3	9 75@10 00
Southern Gray Forge	9 75
Southern Charcoal No. 1	12 50
Missouri Bessemer	12 00
Ohio Softeners	14 00
Lake Superior Car Wheel	13 50
Southern Car Wheel	13 25

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$14 00
Old steel rails (6 ft. and over)	9 50
Old steel rails (6 ft. and under)	9 50
Old car wheels	11 00
	NET TONS
No. 1 R. R. wrought scrap	$10 50
Mill scrap	8 00
No. 1 Machine cast scrap	8 00
Iron axles	15 00
Axle turnings	8 00
Wrought turnings (free from cast)	6 00
Cast borings	5 25
Uncut wrought iron boilers	4 00
Steel boiler plates	8 00
Grate bars	5 00
Pipes and flues (clean)	7 50
Tank iron	8 00
Hoop and band iron	6 50
Sheet iron	5 00
Wrought drillings	6 00
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.15c
Angles	1.10c
Tees	1.25c
Universal Plates	1.15@1.20c
Sheared Plates	1.20c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1½	1.10 Base.
2 to 2½	.20 extra.
3 to 3½	.50 "
3½ to 4	.80 "
4½ to 4½	1.00 "
4½ to 5	1.30 "
5½ to 6	1.80 "
6½ to 6½	2 30 "

6½ to 7¼	2.50 extra.
¾ to ⅞	.10 "
⅞ to 11-16	.20 "
⅛ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1½ to 4 x ⅜ to 1	1.05 Base.
4¼ to 6 x ⅜ to 1	.10 extra
6¼ to 8 x ⅜ to 1	.60 "
8¼ to 10 x ⅜ to 1	.80 "
1⅜ to 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.60 "
6¼ to 8 x 1⅝ to 2	.80 "
8¼ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1¾ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
¾ to 15-16 x ⅜ to ¾	.40 "
⅜ to 11-16 x ⅜ to ⅝	.50 "
⅛ to 9-16 x ⅜ to ⅜	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1½ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅜ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

to 8 x No. 9 to 3-16	.90 extra.
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¾ to 4 x No. 9 to 3-16	.40 "
1¾ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1 40 "
⅜ x No. 9 to 3-16	1.50
⅜ x Nos. 10, 11 and 12	1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1½	.40 extra.
¾ to 13-16	.50 "
⅞ to 11-16	.60 "
⅛ to 9-16	.80 "
⅜ to 7-16	1.10 "
⅛ to 9-16 x 3-16	1.00 "
⅞ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅞ to 11-16	.90 "
⅛ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
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Half Ovals less than ¼ their width in thickness, extra price.

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Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16 "	1.50 Base. Extras.
1½ to 6,	" 10, 11, 12 or 1/4"	.05 per 100 lbs.
1 to 1¾,	" 7, 8, 9 or 3-16"	.10 "
1 to 1¾,	" 10, 11, 12 or 1/4"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or 1/4"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10 11, 12 or 1/4"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10 11, 12 or 1/4"	.45 "
½, Nos. 7, 8, 9 or 3-16"		.55 "
½, " 10, 11, 12 or 1/4"		.60 "
7-16 " 7, 8, 9 or 3-16"		.75 "
7-19 " 10, 11, 12 or 1/4"		.85 "
⅜, " 7, 8, 9 or 3-16"		.95 "
⅜, " 10, 11, 12 or 1/4"		1.05 "

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base. Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs.
1 7-16 to 2,	" 20	.10 "
1 7-16 to 2,	" 21	.15 "
1 -16 to 1¾,	" 22	.25 "
1 1/16 to 1¾,	" 13, 14 and 15	.05 "
1⅛ to 1⅜,	" 16,17,and 18	.10 "

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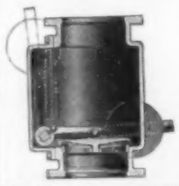

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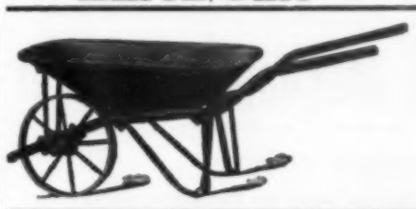

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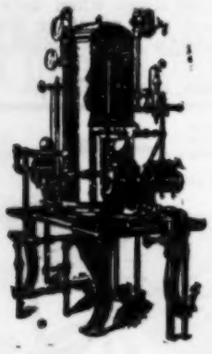

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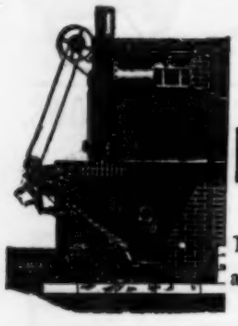

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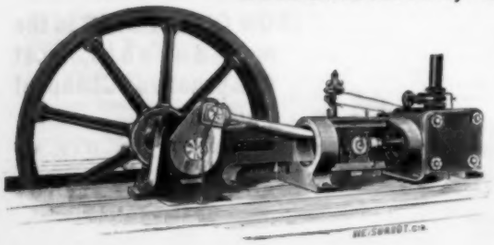

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1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞, Nos.		13, 14 and 15	.20 "
⅞, "		16, 17 and 18	.25 "
⅞, "		19 and 20	.30 "
⅞, "		21	.35 "
⅞, "		22	.45 "
¾ and 13-16 Nos.		13, 14 and 15	.30 "
¾ and 13-16 "		16, 17 and 18	.35 "
¾ and 13-16 "		19 and 20	.40 "
¾ and 13-16 "		21	.45 "
¾ and 13-16 "		22	.50 "
¾ and 13-16 "		23	.60 "
11-16, Nos.		13, 14 and 15	.35 "
11-16, "		16, 17 and 18	.40 "
11-16, "		19 and 20	.50 "
11-16, "		21	.60 "
11-16, "		22	.70 "
11-16, "		23	.80 "
⅝, Nos.		13, 14 and 15	.40 "
⅝, "		16, 17 and 18	.45 "
⅝, "		19 and 20	.55 "
⅝, "		21	.65 "
⅝, "		22	.75 "
⅝, "		23	.85 "
9-16, "		13, 14 and 15	.45 "
9-16, "		16, 17 and 18	.50 "
9-16, "		19 and 20	.60 "
9-16, "		21	.70 "
9-16, "		22	.80 "
9-16, "		23	.90 "
½, "		13, 14 and 15	.55 "
½, "		16, 17 and 18	.60 "
½, "		19 and 20	.70 "
½, "		21	.80 "
½, "		22	.90 "
½, "		23	1.00 "
7-16, "		13, 14 and 15	.80 "
7-16, "		16, 17 and 18	.90 "
7-16, "		19 and 20	1.00 "
⅜, "		13, 14 and 15	1.00 "
⅜, "		16, 17 and 18	1.10 "
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No. 10	1 50
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No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

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Flange	1 55
Marine Flange	1 60
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104 to 106 in. wide	special.

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⅜ to 11-16 and 4⅛	.10
⅛ to 6 in.	10½
¼ to 9-32 and 6⅛ to 7 in	.11
1 in.	.13

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Bridge ½, ⅝, 11-16 and ¾ inch diam.	2 55

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Lap " galv. " "	.70
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	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 35c
Copper.....dis 35c
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75& 5
" " Nos. 27@36.....dis 75&10& 5
Coppered Nos. 0 to 18, market list.....dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis65& 5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
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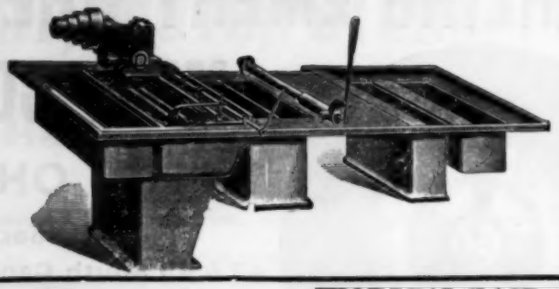

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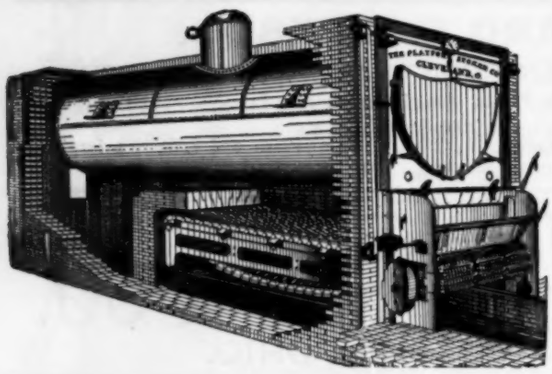

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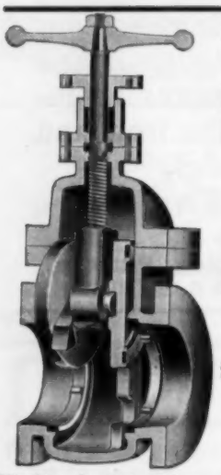

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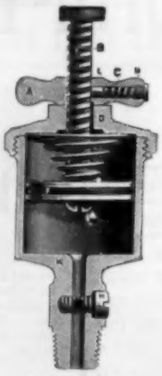

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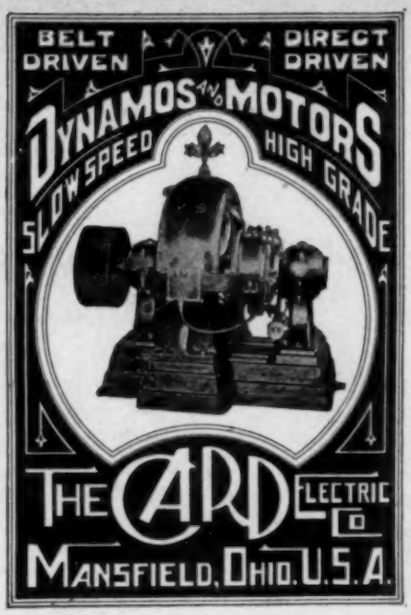

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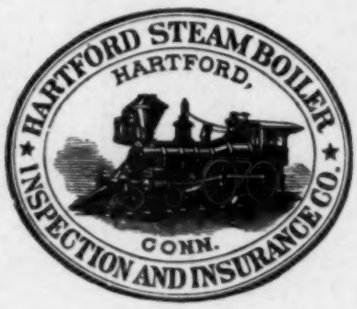

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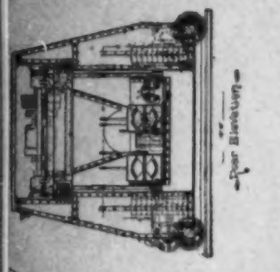

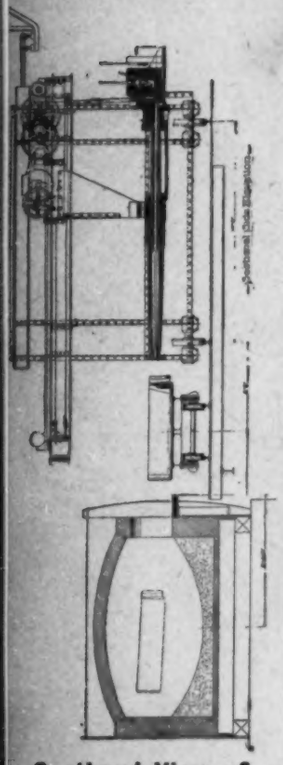

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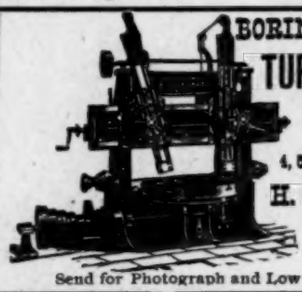

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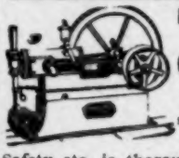

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